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THE

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EDITED BY

J. MARK BALDWIN, Johns Hopkins University AND HOWARD C. WARREN, Princeton University

CHARLES H. JUDD, Yale University (*Editor of the Monograph Series*).

WITH THE CO-OPERATION FOR THIS SECTION OF

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THE PSYCHOLOGICAL REVIEW.

A RECONCILIATION BETWEEN STRUCTURAL AND FUNCTIONAL PSYCHOLOGY.[1]

BY MARY WHITON CALKINS,

Wellesley College.

In his address, delivered last August in Capetown before the British Association for the Advancement of Science, Professor George H. Darwin thus contrasts the biological and the physical sciences: "The biologist," he says, "adopting as his unit the animal as a whole, discusses its relationships to other animals and to the surrounding condition. The physicist * * * is irresistibly impelled to form theories as to the intimate constitution of the ultimate parts of matter." By these words Mr. Darwin indicates a distinction between two fundamental scientific procedures: on the one hand, the study of the scientific phenomenon as a complex of elements, on the other hand, the study of it as related to its environment. The first is known as the structural, the second — for reasons that I shall later elaborate — may be named the functional method in science.

Mr. Darwin's special purpose in distinguishing between these two scientific conceptions is, as he says, to discuss "the extent to which ideas, parallel to those which have done so much toward elucidating the problems of life hold good, also, in the world of matter. I believe," Mr. Darwin adds, "that it will be possible to show that in this respect there exists a re-

[1] This paper, substantially as written, was presented, as President's Address, to the American Association of Psychology, at its meeting in Cambridge, December, 1905. The third paragraph on page 67 has been added to meet a criticism made in the course of an informal discussion of the paper.

semblance between the two realms of nature which is not merely fanciful."[1] And his conclusion is that communities of atoms, no less than communities of animals or even than political communities, are subordinated to the law of natural selection, in other words that they are in a perpetual struggle for existence. Their 'stability,' he asserts, is "a property of relationship to surrounding conditions. * * * The existence of some is so precarious that the chemist in his laboratory can barely retain them for a moment; others are so stubborn that he can barely break them up. * * * The more persistent or more stable combinations succeed in their struggle for life."

For the purposes of this address, the significant feature of the passage I have quoted is not its specific application of the conception of natural selection to atoms — but its extension, to the whole domain of science, of the doctrine that all phenomena are fundamentally related to environment and must be studied from the standpoint of these relationships. Such an extension of the functional procedure does not, however, it must next be observed, interfere with the constant validity of the structural procedure — the analysis of phenomena into elements. Mr. Darwin does not suppose that the physicist will cease to feel an irresistible interest in the intimate constitution of the ultimate parts of matter because he interests himself, also, in the relations among each other of these very ultimate parts. What Mr. Darwin is trying to accomplish is in fact not the annihilation but the supplementation of the old method of analysis. He is arguing that a physical or a chemical phenomenon has both to be analyzed into its elements and to be described as a complex of relationships with coördinate phenomena. He claims, in other words, that the biologist holds no exclusive right to the functional method, or — as he might well add — the physicist to the structural method.

I have dwelt at such relative length on Mr. Darwin's discussion, because I wish to make his plea for the union of the two

[1] Mr. Darwin extends his supposition, on the one hand, to those communities of negative electricity of which it is now inferred that the atom is composed, and on the other hand to meteoric orbits. (For detail with reference to the hypothesis last named, cf. Part II. of his presidential address, delivered August 30, 1905, at Johannesberg.)

scientific conceptions the basis of this evening's address before the American Association of Psychology. In contemporary psychology, the two procedures, structural and functional, are too often opposed to the point of mutual exclusion. The structural psychologist is often wont to ignore functional relations and the functional psychologist to condemn structural psychology as an artificial, abstract, and inadequate account of consciousness. The object of this paper is to show that the two conceptions, structural and functional, are readily combined, if only the basal fact of psychology be conceived as a conscious self, that is, as a self-being-conscious. The combination of the two procedures is — I shall argue — in this way made possible, because a self-being-conscious is not only analyzable into elements but is also a complex of relations to its environment, social and physical. In more detail, my procedure in this paper will be as follows: I shall first attempt to describe the nature of the psychologist's self, distinguishing it as basal phenomenon of psychology on the one hand from the psychic event — the mental process or idea — and on the other hand from the biologist's, the philosopher's, and the sociologist's self. I shall next try to show that this psychologist's self is rightly conceived as fundamental both to structural and to functional psychology, and that it should therefore be studied by both methods. I shall, finally, point out that psychic experiences may adequately be described in terms of such a self.

I. The Conscious Self as Basal Fact of Psychology.

By self as psychic fact I mean what the plain man means by self, in so far as this does not involve the view that body constitutes part of a self.[1] This conscious self, the plain man's self, in the developed form in which we commonly study it, is in the first place realized as underlying the experiences of the moment — as having percepts, images, and the like, or, more exactly, as 'perceiving,' 'imagining,' and 'feeling.' And, in the second place, every self, besides being fundamental to its own ideas or experiences, is also a related self. That is to say, I

[1] For justification of this omission, cf. below, p. 66.

am always conscious of myself as in some way related to my environment, social or physical.

This doctrine of the self as the fundamental psychic phenomenon must be defended, first of all, from the counter-theory that the basal fact of psychology is the psychic event, and its corollary that a self is a mere series or system of such psychic events. The psychic fact, conceived after this second fashion, has been named by Locke the 'idea,' by Hume the 'perception,' by Spencer the 'feeling.' Titchener, one of the most consistent of modern upholders of the structural doctrine, calls the psychic event 'mental process.' Locke's term, 'idea,'[1] seems to me the simplest and the best to designate the psychic phenomenon from this point of view: the fact of consciousness, considered as strictly individual, in artificial isolation from other facts, and — in particular — considered quite apart from any self or mind. As thus employed, in Locke's fashion, the term 'idea' of course covers emotion, belief, and volition as well as percept, image, and thought.

I have on other occasions argued that psychology, thus conceived as dealing with ideas, that is, with psychic events, is a perfectly consistent science, and that every sort of concrete conscious experience, thought and volition quite as well as percept and image, may be described simply as consisting of certain elements of consciousness. But in spite of the abstract possibility of conceiving consciousness as a series of ideas and psychology as the science of this stream of ideas, I am none the less convinced that not the idea but the self should be taken as the basal fact of psychology. There are two reasons for the superiority of this self-doctrine. In the first place, the idea is itself an abstraction which invariably implies a self. And, in the second place, the description of consciousness through the analysis of ideas is not a full and adequate account of actual conscious experience. These assertions must be separately considered.

Every idea implies a self somewhat as every sector implies

[1] By the use of this term, Titchener seems to me to invalidate his own conception of mind as 'sum or series of mental processes' (*Outline*, § 3; cf. *Primer*, § 4). A process is not something which can be summed or added; it is, as Titchener himself says, 'a becoming something' (*Outline*, § 2).

a circle, or as every cell implies an animal body. No one can conceive of an idea except as the idea of a self: in other words, the idea is immediately and unavoidably known to be somebody's idea. In the words of Lipps, "the immediately experienced I (*das unmittelbar erlebte Ich*) is the central point of the life of consciousness. To every content of consciousness," he adds, "belongs this relatedness to the I."[1]

One may find, indeed, in every manual of psychology confirmation, intended or unintended, of this assertion that the idea, the psychic event, always implies the self as its necessary background.[2] One may gain warrant, also, for the second count in the indictment, the charge that the idea, or psychic event, when conceived as basal fact of psychology, is not merely an abstraction, but an abstraction in terms of which conscious experiences are not adequately described. This follows from what has been said concerning the related nature of the self. Obviously, the experiences of a self, which is a bundle of relations both to selves and to things, need a further statement than that in terms of a succession of its own ideas. This is as evident as that the full description of a given animal must not merely enumerate the different structures of which its body consists, but must indicate its reactions on its environment — must tell, for example, whether it is graminivorous or carnivorous, and whether it swims or walks.

To this inadequacy of idea-psychology I shall recur in the final section of this paper. For the present it is necessary to add to this distinction of the self from the idea as sharp a contrast as can be drawn between the psychologist's self, thus defined, and the biologist's, the philosopher's, and the sociologist's self.

[1] *Leitfaden der Psychologie*, S. 2. Lipps has made, furthermore, what unhappily he does not consistently and systematically use, a fruitful distinction between two fundamental attitudes of the I: *Einfühlen*, in which the I identifies itself with its 'other,' and *Gegenüberstehen* in which the I opposes itself. Had Lipps but applied this distinction, he would have made of the *Leitfaden* a significant contribution to systematic psychology.

[2] Cf. the passage, often cited, of James's *Brief Psychology*, p. 153. Cf. also the passage quoted from Titchener, below, p. 78; and the even more instructive definition of 'a mental process' (*Outline*, § 2) as 'any process falling within the range of our experience in the origination and continuance of which we are ourselves necessarily concerned.'

By self as fundamental fact of psychology is not meant, in the first place, the psycho-physical organism, body plus consciousness or body regarded as possessed of consciousness. To this conception of the psycho-physical organism as psychic fact, the objection is, very briefly, that the doctrine belongs not to psychology at all, but to biology. Biological science may very properly study the nature, the relations and the development of the whole animal regarded as a body which has consciousness,[1] but psychology, if a science at all and not a mere department of biology, is a 'science of consciousness,' and as such cannot properly adopt as its basal phenomenon a complex of physical and psychical. The practical outcome of such a combination is, I think, as Titchener suggests,[2] that the psychical comes to be regarded not as coördinate with the physical but as function of it, so that the fact 'that these underlying processes are psychical becomes an accident.'

It is equally necessary to insist that the psychologist's self is not identical with the philosopher's. A self as psychic fact is not an object of philosophical argument but of immediate consciousness. In other words, no question arises of its ultimate nature: it is taken for granted, as any object of any science is, without further investigation. Just as a mineralogist takes for granted that there are stones, and just as a zoölogist takes for granted that there are animal bodies, so a psychologist takes for granted the existence of selves.

It is impossible to lay too great stress on this distinction between the philosopher's and the psychologist's self, since the tendency to confuse the two is responsible, I think, for the opposition on the part of the structural psychologists to the view here maintained, and thus for the counter theory that the self, as far as psychology is concerned with it, is a mere sum or

[1] Professor Baldwin's *Development and Evolution*, is a good example of such a primarily biological study. It discusses the 'development and evolution of mind and body taken together.' From such a standpoint, as Baldwin says, 'changes in mind and body go on together, and together they constitute the phenomena.' I am not objecting to this procedure, but simply arguing that it is biological, not psychological.

[2] Cf. his paper on 'The Postulates of a Structural Psychology,' *Philosophical Review*, VII., 1898, pp. 449–465.

series of ideas. The strength of this Humian doctrine has lain in the supposition that the only alternative to it is a philosophy of the self. But though sound philosophy is based on psychology and may well start, as Descartes's did, from the myself as immediately observed, yet psychology need not and should not reach over into philosophy. Psychology does not reason about the place of its selves in total and ultimate reality, but simply accepts them on their face value as observed facts.

The related self as basal psychic phenomena should be distinguished, finally, from the fundamental fact of sociology, namely, the social organism. The basal fact of psychology is the individual self in its relations, primarily social; the unit of sociology is the interrelated system of selves. Psychology, in other words, lays stress on the individual, while insisting that the individual is constituted, in great part, by its social relationships; sociology emphasizes the family, the state, the community, though recognizing the individuals as its members. The relation of psychology to sociology is, in fact, closely similar to that between physiology and zoölogy. As the basal fact, or unit, of psychology is the socially related individual, so the basal fact of physiology is the single body — studied, to be sure, as related to environing bodies. And somewhat as the unit of sociology is the community, the unit of zoölogy is the species.

To this conception of the self as basal fact of psychology, it is often objected that self-consciousness is late in making its appearance and that psychology as science of consciousness of every sort must concern itself with psychic facts below the level of self-consciousness. I take direct issue with this common doctrine, believing that there is no consciousness which is not self-consciousness. Of course, there is an illimitable difference between the developed consciousness which is that of every psychologizing self, and the undifferentiated consciousness of sleepy adult, of baby, or of animal. Obviously, the baby, the animal, and the sleepy adult do not make the contrast which the psychologist makes, between the self and its experiences or ideas, nor yet between the self and its environment. But one never has consciousness, the sleepiest or most inchoate, which does not involve an experience qualitatively similar to that later

consciousness which every one agrees to call self-consciousness. This simplest self-consciousness is not a reflective distinction of self from environment, though it may later be replaced by such reflective consciousness. But anything less than self-consciousness would not be consciousness at all: to be conscious is to be conscious of a conscious self.

The only ground for denying this plain outcome of introspection is the old confusion between the implicit consciousness of self, often vague and undifferentiated, belonging to every experience, and either the discriminating self-consciousness of the reflective adult or, more developed still, the philosophically-reflected-on self of the metaphysician. The psychologist concerns himself not at all with this philosopher's self; but he has to do with the undeveloped self-consciousness, a self which one remembers from one's own sleepy states and imputes to animals and to babies, and primarily, he is interested in the developed self-consciousness of the adult.[1]

II. Self-psychology as Reconciliation Between Structural and Functional Psychology.

I have so far been concerned to make clear the conception of the conscious self as basal fact of psychology. I have now to show that this conception facilitates, and indeed necessitates, a union between structural and functional psychology. To make this point, I shall try to show that each of these terms, structural and functional, is ordinarily made to cover both a doctrine of psychological analysis and a doctrine concerning the basal fact

[1] In further elucidation of this distinction, I may quote from my paper on the 'Limits of Comparative and Genetic Psychology': "Animals, if they are conscious at all, must be conscious of selves, for consciousness of any other sort is inconceivable. To be conscious simply means to be conscious of oneself in this or that or the other situation. The only ground for questioning this view is * * * the old tendency to confuse the implicit self-consciousness of every experience, with the definite, reflective self-consciousness of the psychologist or the philosopher. Self-consciousness in the latter sense is as impossible to the animal as to the child, and is properly opposed by the argument: babies and animals because incapable of abstraction are therefore incapable of self-consciousness. Self-consciousness as a vague, undifferentiated sense of what Hobhouse calls 'self as a pervading identity and permanent character,' every animal which is conscious at all must possess." (*British Journal of Psychology*, Vol. I., p. 283, January, 1905.)

of psychology. I shall argue (1) that structural psychologists and one group (but one group only) of functional psychologists are unjustified in their doctrines of the basal psychic phenomenon; but that (2) in their doctrines of psychological analysis, both structural and functional psychology are right: the analysis of the one supplements that of the other — in Professor Angell's words, 'every description of function involves some reference to structural elements, just as the actual functions themselves involve structure.'[1] Finally (3), I shall argue that both sorts of analysis, structural and functional, are essential to an adequate self-psychology.

I shall develop this conception, first, with reference to structural psychology. According to a common prejudice, the analysis into elements, sensational, affective, and the like, necessarily involves the assumption that the analyzed psychic phenomenon is the psychic event or idea. Thus, structural psychology becomes synonymous with idea-psychology. But the artificialness and inadequacy of this conception of the psychic unit as idea has already been shown. Certainly, the idea is not the immediately observed, basal psychic phenomenon. And for this reason, the functional psychologists are wont to decry and to oppose what they call the structural psychology. They overlook the fact that the really characteristic feature of the structural psychology is not at all its atomistic unit, but rather its analytic procedure. Structural psychology consists essentially in the teaching that the task of psychology is first, to analyze typical experiences until one reach irreducible elements, and second, to classify the ordinary sorts of complex experience according as one or another of these elements predominates. The structural psychologist may, and does, supplement this analysis and classification by seeking for each experience or typical class of experiences a scientific explanation — that is, by seeking to link it with other facts, or groups of fact, whether psychic, physiological, or physical. Thus, the percept, for example, is conceived as psychic complex in which sensational elements predominate, is further classified as visual,

[1] 'The Relations of Structural and Functional Psychology to Philosophy,' Decennial Publications of the University of Chicago, First Series, III., p. 57.

auditory, and the like, by the preponderance of this or that class of sensational elements, and is explained by being correlated, on the one hand with the excitation of occipital lobe and retina and of corresponding muscles, and on the other hand, with the vibrations of the ether. It must be borne in mind that the analysis and classification are the only essential parts of this procedure, and that the explanation through physical and physiological facts is a useful addition to structural psychology, not an integral part of it.[1]

Now it is past doubt that this structural analysis of a psychic state is always possible. As actually carried out in the past by structural psychologists, the analysis has, to be sure, been often inadequate. But contemporary structural psychology is characterized by a growing fineness of discrimination. This is evident especially in the modern recognition of relational along with sensational and affective elements of consciousness. What Spencer so long ago insisted on is at last being admitted by almost all structural psychologists: that thoughts and recognitions, volitions and beliefs are not adequately described, even from the structural standpoint, as mere complexes of sensation and affection; and that among the irreducible elements fused together in consciousness are the feelings of 'and,' 'like,' 'more' and 'not' as well as the sensational feelings — say, of 'blue,' and of 'bright' — and the affective elements, as 'pleasant' and 'unpleasant.'

But this analysis into structural elements — it must be insisted — is not necessarily the analysis of an idea or psychic event: it is, on the other hand, quite as easy to discover the structural elements of consciousness regarded as experience of a self, for though every conscious experience is some relation, simple or complex, of a self to its environment, it is also a complex of different elemental experiences, sensational, affective and the like; and these elemental experiences are of course to be regarded as excited and accompanied by specific bodily conditions. In a word, psychology as science of conscious and

[1] It follows that the tendency of some psychologists to treat the physiological and physical analysis as primary is fundamentally untrue to the principles of structural psychology.

related selves may and should undertake the analytic discovery of elements of conscious experiences as such. By virtue of this structural procedure it is truly a structural psychology, though it utterly repudiates the doctrine of the psychic event, or idea, as the basal fact of psychology.

From this effort to demonstrate that self-psychology includes the essential part of structural psychology, I turn to consider the relation between functional and self psychology. Functional psychology, also, is a term which has been used to indicate both a conception of the fundamental fact of psychology and a characteristic sort of psychological analysis. As regards the doctrine of the unit of psychology, functional psychologists are agreed in their well justified opposition to the atomistic conception of the idea as basal fact or unit of psychology. Positively, they present no united front, but many — perhaps most of them — conceive the psycho-physical organism as the basal fact of psychology, holding that the concern of psychology is with the relations of the functioning psycho-physical self, the conscious body, to its environment. This, as I have tried to show, is an unwarranted substitution of a biological for a psychological conception. It seems, furthermore, to form no inherent part of functional psychology, since many functional psychologists do not hold it. Angell, for example, follows up the assertion that the psycho-physical organism is a real unit, by the admissions that 'the separation of mind from body may be made in behalf of some one of our theoretical or practical interests.' He says, indeed — though I do not think that his procedure always conforms to the statement — that the 'primary task' of psychology 'is to analyze and explain mental facts.'[1] Professor Mead, going further, seems to me expressly to identify the basal fact or unit of psychology with the self, the 'I' or 'subject in persona,' as he calls it, 'the subject that is * * * more than an assumption.'[2]

Functional psychologists are, thus, far from unanimous in teaching that the psycho-physical organism is basal fact of psy-

[1] *Psychology*, p. 6.

[2] 'The Definition of the Psychical,' *Decennial Publications of the University of Chicago*, First Series, Vol. III., Part II., pp. 104 *seq.*

chology and are in my opinion, wrong in so far as they hold the doctrine. The truth is, however, that functional, like structural psychology consists essentially not in a doctrine of the unit of psychology, but rather in a type of psychological analysis. As such, it seems to me to embody the following conceptions: first, and fundamentally, the conception of consciousness in terms of the relations to environment which it involves; second, the conception of consciousness in terms of the significance or value of these relations. I shall try to show that functional psychology, conceived after the first fashion, may coincide with self-psychology; and that, viewed in the second manner, it may be supplementary or subordinate to self-psychology.

It can hardly be denied that functional psychology, whatever more it includes, does include this conception of consciousness as experienced relation to environment. This is implied in the reiterated emphasis laid by functional psychologists upon the significance of 'reaction' and 'response.' It is often clearly stated in their definitions. Angell, for example, speaks of sensation as 'the psychical function by which the organism is first brought into contact with its environment';[1] and Dr. Gore describes imagery as functioning 'on the side of response.'[2] But this, which is the characteristic conception of functional psychology, is not merely reconcilable with self-psychology: it is a part of self-psychology. For self-psychology, as truly as functional psychology, regards conscious experiences as relations to environment. Nothing else, indeed, can be meant by the conceptions of activity, passivity, sympathy, and opposition, by which it is necessary to distinguish psychic facts viewed as experiences of a self.[3]

It is true that functional and self psychology, as actually formulated, do not always give identical descriptions of the environment to which the psychic unit is related. The functional psychologist tends to emphasize the physical, or — more pre-

[1] *Op. cit.* in *Decennial Publications of the University of Chicago*, Series I., Vol. III., Part II., p. 58.

[2] 'Image and Idea in Logic,' in 'Studies in Logical Theory,' *Decennial Publications of the University of Chicago*, Series II., Vol. XI., p. 196.

[3] Cf. pp. 76 *seq.* of this paper.

cisely — the biological environment, whereas the self-psychologist lays stress on the social, or personal, environment. Yet even here, there is substantial agreement. For all functional psychologists, at least implicitly, acknowledge social relationships and Angell even says: "We shall regard all the operations of consciousness as so many expressions of organic adaptations to our environment, an environment which we must remember is social as well as physical."[1] Conversely, though self-psychology, as I conceive it, regards the relations of a self to a personal environment as logically and genetically prior, it also takes account of impersonal emotions and of will directed to external and impersonal situations — in a word, of an impersonal environment.[2]

The cardinal conception of functional psychology, that of consciousness as involving internal relation to environment, is evidently, therefore, an integral factor of self-psychology. But functional psychology includes the supplementary doctrine that consciousness is to be conceived and classified, not merely as relation in general, but as 'effective' or beneficial relation — in other words, as a function which has meaning or value. Function, in other words, is defined as 'part played with reference to reaching or maintaining an end.'[3] This doctrine of the functional psychologists — a symptom or an application of the modern movement in philosophy known as pragmatism — hardly needs to be illustrated. It appears in Angell's descriptions of the cognitive functions as 'one of the points at which consciousness is most obviously of value,'[4] and in his statement that 'truth or falsehood are impressive names for relatively complete (*i. e.*, successful) and relatively incomplete (*i. e.*, unsuccessful) operations of adaptation'; and in his teaching that in volition 'consciousness is selective of the beneficial.' And Dr. Arnold, who has recently come forward in defense of functional theory, says that 'perception is studied as giving meaning to the object concerned,' and that 'images are to be considered as logical aids to action.'[5]

[1] *Psychology*, p. 7.

[2] Cf. my *Introduction to Psychology*, pp. 276 *seq.*, 309; *Der doppelte Standpunkt in der Psychologie*, pp. 63, 74.

[3] J. Dewey, 'The Reflex Arc Concept,' PSYCHOLOGICAL REVIEW, Vol. III., p. 365, 1906.

[4] *Decennial Publications*, *op. cit.*, pp. 64, 65.

[5] PSYCHOLOGICAL BULLETIN, II., p. 372, November, 1905. Cf. the common

Whatever the nature of this method of describing psychic facts in terms of their utility, such a conception evidently may be harmonized with the doctrine that the psychic self, not the psycho-physical organism, is basal fact of psychology. For surely not merely the bodily organism, but the thinking, feeling, struggling self as well, is capable of more or less 'successful,' 'useful,' and 'complete' relations with its environment, whatever the standard of utility adopted. Keen perception, vivid imagination, subtle thought may strengthen the self in its conscious opposition to environment or in its equally active adaptation. This is merely to say that all experiences tend to the development of self-activity. There is thus no description of a psychic content as promoting efficiency, or as giving meaning, but may be appropriated by the self-psychologist.

This is not the place in which to discuss the more fundamental question whether it is expedient, as well as possible, to regard use or value as technically psychological terms. If such a procedure were carried to its limits, 'a thoroughgoing-functional psychology,' as Angell frankly recognizes, 'must ultimately issue in investigations which are nowadays the exclusive possessions of logic, ethics, and æsthetics, respectively.'[1] I am myself inclined to the conservative view that psychology, though forming both an indispensable basis and a constituent part of æsthetics and ethics, differs from each in so far that it never assumes either value, beauty, or truth as, for purposes of strictly psychological description, an ultimate term. It would follow that the value of a given sort of consciousness would be, from the standpoint of psychology, an allied but not a constituent fact. But I am not now concerned to argue this point. My contention is simply the following: Admitting the propriety of the functional psychologist's descriptions in terms of value, we may still insist that values are primarily personal: in other words, that the terms apply primarily to the self in social relations and not exclusively or necessarily to the psycho-physical organism.

description of the function of a psychical state as 'that of reconstruction of the disintegrated coördination.' Mead, *op. cit.*, p. 106 *seq.* Cf. Dewey, *op. cit.*, pp. 358, 361, *et al.*: and Bawden, *Philos. Rev.*, 1902, 1903.

[1] *Decennial Publications*, *op. cit.*

From all this it follows that functional psychology, rightly conceived, is a form of self-psychology, that its basal phenomenon is the psychologist's self, and that its significant contributions to psychology are, first, its doctrine of the inherent relatedness of self to environment, and second, its insistence on the progressive efficiency or utility of these relations. Certain writers known as functional psychologists do, it is true, hold conceptions irreconcilable with those of self-psychology. These are the teachings that the unit of psychology is the psychophysical organism and that the concern of psychology is with the sensori-motor processes of this organism, as such. But it has been shown that this doctrine lacks the assent of many functional psychologists, and that it substitutes for a purely psychological a physiological or a biological conception. Pruned of these biological excrescences, a functional psychology — as I have tried to show — is a self-psychology.

The refusal to admit the physiological organism and its processes as genuinely psychological phenomena does not, of course, prevent the acknowledgment of them as correlated facts. The self-psychologist, in other words, takes accounts of the sensori-motor processes, the bodily reactions and attitudes, on which the functional psychologists lay stress, just as he takes account of the neurological phenomena which the structural psychologist emphasizes. He does not, to be sure, hold that either the organism or any movement or attitude of it is in itself a psychic phenomenon, any more than he holds that a nerve excitation is a psychic event. Yet he may and practically does assume that psychic facts are conditioned or accompanied or followed by physiological and biological phenomena. He regards the organism, in other words, as the physiological correlate of the self, and the bodily movements as antecedents, or correlates, or consequences of psychic phenomena. Thus, for him, also, the bodily attitudes and reactions have a special significance in that they serve as adaptations of bodily organism to biological and physical environment.[1]

[1] This way of regarding the bodily reactions as objective external facts, parallel with forms of consciousness, does not of course, do away with the possibility of analyzing the consciousness of any bodily movement into elements

With this conclusion, I have reached the end of the second section of this paper. I have tried to show that self-psychology, the doctrine that the conscious self is the basal fact of psychology, harmonizes the essential doctrines of a structural and of a functional psychology. I have argued this on the ground that consciousness, which always implies a conscious self, is a complex alike of structural elements and of relations of self to environment. Such a doctrine of psychology forms, I have also attempted to show, a basis for the neurological and biological explanations of psychic fact which are current in psychology.

III. The Description of Consciousness in Terms of Structure and of Personal Relation.

In the final section of this paper I shall try to justify my general conclusion by a more detailed reference to concrete conscious experiences. I shall aim to show briefly, first, that these actual experiences[1] cannot adequately be described by enumerating their structural elements, and second, that the conception of them as relations of self to environment involves or allows all the teachings essential to functional psychology. (This second purpose cannot be systematically carried out, since — if I am not mistaken — no functional psychologist has ever attempted a full and consistent description of all classes of psychic fact in terms of efficiency or of bodily activity. The functional conception has either been employed to supplement descriptions in terms of structure, or it has been applied to a few cases only of consciousness.)

In my *Introduction to Psychology* and in a later monograph, I have attempted in some detail the description of conscious experiences in terms both of structural psychology and of basal

of consciousness, mainly sensational. Thoughtful functional psychologists find no difficulty in admitting this. Cf. Dewey, *op. cit.*, p. 364: "Motion as psychically described, is just as much sensation as is sound or light or burn." Cf. also, the sentence quoted from Angell on page 69. For an example of the false opposition of function to structure, cf. Felix Arnold (already quoted on page 73) in the Psychological Bulletin, *op. cit.*, p. 372.

[1] It is perhaps unnecessary to point out that I use the term 'experience,' or the pleonasm 'conscious experience,' not as opposite of 'thought' but as convenient synonym for 'a consciousness,' that is, as a general term, covering perception, thought, emotion — in a word, all sorts of consciousness..

personal relations. There is time, this evening, to consider certain cases only which illustrate the fact that self-psychology supplies a principle of description and of classification wholly lacking to structural psychology, and fundamental to the distinctions of functional psychology. The forms of consciousness which I shall try to analyze are three: imagination, emotion, and will. For the dogmatic brevity of my discussion, the limits of my time are responsible.

From the standpoint of an exclusively structural psychology, perception and imagination are alike complexes of elements mainly sensational. Külpe and Titchener seem to me to have shown conclusively that no invariable difference — of vividness, stability or detail — distinguishes the two.[1] In other words the difference between perception and imagination is, on the basis of structural psychology, physiological, not psychological — it is the occurrence in the case of perception of end-organ excitation.[2] Self-psychology, on the other hand, makes a clear-cut and strictly psychological distinction between perception and imagination: in perceiving, I am or may be conscious of myself as sharing my experience with unparticularized other selves, whereas in imagination this consciousness is inevitably lacking. This description in terms of personal relation is, of course, to be supplemented by a structural analysis. For the enumeration of structural elements, though it does not constitute the complete description of a psychic phenomenon, is an essential part of such a description. Imagination, defined as it should be from both points of view, is a sensational complex, usually lacking maximum stability, vividness and duration, which is reflectively realized as peculiarly the private experience of 'myself.' On the physiological side, the sensational character of imagination is correlated with specific neural excitations.

Such a description of imagination in terms both of personal relation and of structural elements serves, as well as the purely

[1] *Grundriss der Psychologie*, § 33, 6 *seq*; *Outline of Psychology*, § 43.

[2] In a review of my *Der doppelte Standpunkt in der Psychologie* (*Jour. of Psy., Phil.*, etc., Dec., 1905), Professor M. F. Washburn suggests that the 'feeling of realness' should or might be taken as the distinction of perception structurally regarded. Waiving other objections, I may observe that this would obliterate the distinction between perception and belief.

structural conception, as basis for the characteristic functional doctrine that imagination is stimulus for action. Taken by itself, it should be noted, this 'functional' description of imagination would not adequately distinguish it either from perception or from volition.

The study of emotion reveals an even more obvious inadequacy in the structural method. An emotion is readily described by the structural psychologist as a complex of affective elements with sensational experiences, including organic and kinæsthetic sensations. But an emotion is not adequately described in these terms: it does to be sure include the affective and the sensational elements, but it is also the realized personal relation of one self to individualized self or object. This is so evident to introspection that even structural psychologists unwittingly imply the self in their descriptions of affective states, as when Titchener says: "Regarded from the point of view of ordinary life, blue and warm are somehow detachable from oneself * * * whereas pleasantness is always within oneself."[1]

This realized consciousness of self is, of course, most evident in the case of any doubly personal emotion, an emotion for which object as well as subject is a self. Thus it is, in my opinion, utterly impossible, if one adhere solely to the structural standpoint, to distinguish pride from joy, or sympathetic from purely egoistic sorrow. Both pride and joy are pleasant emotions, and, so far as the obscure organic sensations are made out, both seem to be distinguished by consciousness of bodily conditions involving a general well-being. In a word, pride and joy are not fairly distinguishable till we regard them as personal relations. Then, pride is readily differentiated from joy as involving the comparison of oneself with other selves. Similarly, egoistic and sympathetic grief both are characterized as unpleasant emotions; and both include a vague consciousness of bodily conditions characteristic of bodily depression. No constant organic sensation and no distinction in temporal reference sets one off from the other. The associated ideas may be in both cases the same. Only from the basis of self-psychology, as it involves the consciousness of sharing emotion

[1] *Outline*, 32 (1), p. 95.

with other selves, is sympathetic grief distinguishable from grief of the egoistic sort.

Such a view of sympathy, it is evident, is in accordance with the conceptions of functional psychology, if that term be taken in its widest sense to imply a study of consciousness as involving relations to environment. For the selves of whom in pride or in sympathy one is conscious, form an integral part of one's environment. The subordinate features of a functional psychology may also be correlated with this doctrine. For it is certainly possible to describe, in terms of utility, the emotions thus conceived as relations of a self, and the characteristic bodily attitudes which condition or accompany them.[1] It must, however, be admitted that the list of distinguishable bodily attitudes is not so long as that of the different emotions, so that in the end the personal distinctions are necessary for the complete classification of the emotions.

A third notorious instance of the insufficiency of structural psychology is found in its attempt to describe the experience known as will. Introspection seems to bear unequivocal testimony to the distinctive, *sui generis* character of will — sharply differentiating our volitional experiences from our perceptions, thoughts, emotions, and the rest. In accordance with this observation, structural psychologists once supposed the occurrence of a specific volitional or conative element — an element which should label an experience volitional, just as an affection constitutes it emotional. But the modern school of structural psychology rightly, as it seems to me, teaches the impossibility of discovering in experience a peculiar volitional element. Accordingly it defines the volition as a complex of elements in which there is a predominance of the sensational elements involved in the experience of muscular effort, and of certain relational elements, as well, if such be recognized.[2] This analysis is, I

[1] From the structural standpoint, consciousness of these attitudes is, of course, part of the emotion.

[2] I have chosen, in the interests of a convenient terminology, to limit the term 'volition' to idea-psychology, conceiving a volition as an idea distinguished by the accompanying 'feeling of necessary connection with a future real.' (For elaboration of this view, cf. my *Introduction to Psychology*, pp. 299 *seq.*; *Der doppelte Standpunkt in der Psychologie*, pp. 74 *seq.*) Of course, this is an entirely arbitrary limitation of the term volition, which might as reasonably be employed as synonym of will. Whatever the terms chosen it certainly is expedient to distinguish the two conceptions.

think, substantially correct; and yet it does violence to the plain outcome of introspection, which sharply contrasts will with other sorts of consciousness. Obviously, the contrast must be made otherwise than by feigning a fictitious structural element. It is, in truth, a contrast in personal attitude and relation. For will differs from every other conscious experience, in that it involves an active, not a passive, relation of one self to other selves, or — secondarily — to impersonal objects or events. This sharp contrast of willing from all other forms of consciousness is, for the most part, readily admitted. It is a commonplace of psychology that we are passive in perceiving — that we must be conscious of being blinded or overheated or drenched, whether we will or not. Carefully regarded, it will appear, further, that we are victims of our imagination also, that our visions dawn upon us instead of being created by us. Similarly, we lie prostrate, as Goethe says, beneath the weight of our emotions; and even thought is active only as it is voluntary, that is, as it is initiated or accompanied by will. In opposition to the passivity of these experiences, we all of us recognize what we call the activity of will, as of faith. This contrast of activity with passivity is, it is evident, impossible if the basal fact of psychology be the idea. An idea as pulse of consciousness — as mere temporally located bit of experience — is definable only in terms of its elements. It is neither passive nor active, just as it is neither egoistic nor altruistic. And any one who questions this, may convince himself by re-reading Berkeley's "Principles," and by taking note of Berkeley's futile efforts to make the distinction between passive and active ideas, or, in Berkeley's terminology, between ideas and notions.

On the other hand, this conception of the will as active tallies perfectly with the teachings of functional psychology. For, in the first place, it describes will in terms of relation to environment, personal and impersonal; and, in the second place, it may readily take account of the utility for the conscious self of its active relations; and, finally, on the side of physiology, it enumerates the bodily reactions involved in an active relation to one's environment.

Every conscious experience might be shown, in parallel

fashion, to be both a complex of structural elements and a self as related to environment. This conception and no other does true justice to the rich fulness of the conscious life. Naturally, therefore, it harmonizes the truth in the teachings of structural and of functional psychology. And in so doing, it draws psychology into the forward movement of the sciences. For psychology, conceived as science of structurally analyzable yet socially related selves, may be compared with biology, viewed both as the study of the animal in its relation to environing conditions and as a study of cells and tissues; with physics viewed as conception of the struggle for existence of molecules and atoms which yet are analyzable; and with chemistry when regarded both as analysis into irreducible elements and as the study of corpuscles repelled from each other and attracted to the atom as a whole. In truth, the doctrine of self-psychology accomplishes for our science that union of methods which Mr. Darwin outlines as an ideal barely attained by the physical sciences.

SYMMETRY, LINEAR ILLUSIONS, AND THE MOVEMENTS OF THE EYE.[1]

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In a report of some experiments in the Wundt *Festschrift*,[2] evidence was brought forward that our pleasure in graceful curves could not be due to the ease and smoothness of the eye's own motion in viewing these curves. For the ocular movement itself, when photographically recorded, is found to be interrupted and jerky and most unlike the figures we enjoy.

The experiments I would now report are a continuation of the work thus begun, and have to do with three problems, namely:

1. Can the character of the eye's action explain the peculiar preference we show for symmetrical forms?

2. Can that group of illusions in which eye-movements have perhaps most often been assigned the chief rôle be rightly attributed to eye-movements?

3. To what extent is the so-called Wundt-Lamansky law of eye-movements a valid law?

The general technique of the experiments was practically the same as that described in the paper already referred to. An improvement was introduced, in that by modifying the form of the front of the camera the use of mirrors became unnecessary, and the observer looked directly at the drawings and diagrams used. And in order to check any special effect that might arise from a particular position of the light or from any peculiarity in the movement of either the right or the left eye, the relative position of camera, diagram, light and observer was from time to time alternated between what might be called a right-hand and

[1] Read, in part, at the meeting of the American Psychological Association, Philadelphia, December, 1904.

[2] 'Eye-movements and the Æsthetics of Visual Form,' *Philos. Studien*, Vol. XX., p. 336.

a corresponding left-hand arrangement.[1] And by the farther slight change of directing the camera now toward the right eye and now toward the left in each of these arrangements, four combinations were thus employed. It ought perhaps to be added that although the camera was, at any given time, directed to but a single eye the person always observed the figures freely with binocular vision.

The instructions given the observers were at times somewhat different from those in the experiments previously reported. For in the former experiments certain outlines were presented and the observer was asked to 'follow' the line as best he could while giving what should seem to him a free sweep to the eye. In the present case, however, there was very little of even such loose constraint; for the most part the observer was left entirely to his own devices as to the manner in which he should view the object before him, since in most of the experiments the aim was to discover if possible the natural way of looking at the figures. Where constraint was suggested it was usually for the purpose of recording a series of careful fixations of the eye, in order to make clear the amount of distortion which must be allowed for in translating the photographic records into terms of actual movement.[2] That the results might not be vitiated by reason of any special habits of viewing the figures, induced by the earlier instruction to follow the outline, a group of subjects were chosen who, with a single exception, were new to the work.

[1] For those who may wish more definite details it may be said that the diagram to be observed was placed in front at a distance of 72 cm. At one side of the diagram and directed toward the eye was a very long extension camera with a specially constructed narrow front, so that it might be brought near the diagram without cutting it off from the observer. The distance from eye to camera-lens was 51 cm., and the enlargement upon the plate was about four times. Upon the opposite side of the diagram from that upon which stood the camera was the arc light at a distance of 129 cm. from the eye and making an angle of about 60° with the mean line of sight. Camera and light changed sides in different sets of experiments; and although the light was bright, yet it was so far to one side that the observer felt no inconvenience from it. Where sunlight was used, as in a part of the experiments upon the first of the three problems, the general angular relations of the light to the eye, etc., as above described, were preserved.

[2] See *Philosophische Studien*, Vol. XX., p. 341; and pp. 88–89 of the present article.

These observers were six in number, — Miss Nelson, Mr. Bennett, Dr. Dunlap and Dr. Wrinch, at the University of California; and Dr. Baird and Mr. Williams at the Johns Hopkins University. Without the cordial assistance which they rendered the work would have been impossible. To Professor Ames and Professor Whitehead of the Physics Laboratory of the Johns Hopkins University I am indebted for the use of the microscopic comparator in the measurement of records.

I. The Form of Eye-movements as Affected by their Direction.

In examining the negatives obtained in the experiments on æsthetics, the question had arisen, Whether the movements of the eye showed any characteristic differences according to the direction of their course; and particularly was it interesting to determine in how far the eye's action, when tested by the photographic method, conformed to what has been called the Wundt-Lamansky law. This, as the reader will remember, affirms that vertical and horizontal movements are along straight lines, while diagonal movements are along curves, but curves whose particular form has been somewhat a matter of dispute.[1] In order to get additional evidence upon this whole question of the form of eye-movements, a diagram was so arranged that a central point of fixation gave approximately the primary position of sight, while around this and at a uniform distance of 35 cm. from the central fixation-point there were eight small but distinctly visible black areas representing the four cardinal directions of up, down, right and left, and also the four intermediate, or diagonal, directions. The person who acted as subject of the experiment, starting each time from the center, swept his eye rapidly to one or another of these outlying points and the eye's path was recorded upon the photographic plate.

From an examination of some 250 paths obtained in this

[1] See Wundt, *Beiträge zur Theorie der Sinneswahrnehmung*, pp. 140–142, and 201–202. Lamansky, 'Bestimmung der Winkelgeschwindigkeit der Blickbewegungen, respective Augenbewegungen,' *Archiv für die gesammte Physiologie*, Vol. II. (1869), p. 418. *Cf.* Hering, in Hermann's *Handbuch*, Vol. III., pt. 1, pp. 450–452; and Sanford, *Experimental Psychology*, pp. 124–125.

way from five persons it is clear that horizontal movements have a directness far greater than that of movements in any other direction. The eye more rarely starts in a false direction, and consequently there appear here fewer corrective glides or angular changes of direction as the goal of the movement is approached. The eye in moving horizontally often misjudges the distance, and must either piece out its course by adding a short step or two, or must double slightly upon its track, having overrun its mark. But the direction is usually in need of but the slightest, if any, change.

As for movements up or down, they have a markedly different character from that of horizontal movements. Indeed they are so similar in form to diagonal movements that they must be grouped with these rather than with horizontal movements as is done by the Wundt-Lamansky law. For in all these movements other than horizontal, the eye runs an uncertain course. Its path is often irregular or tremulous, with jerky corrections toward the end. In general the downward movements, while making about as large errors in direction as do the upward movements, have perhaps more dash and 'go' in them, and seem to be made with greater ease. And the diagonals which run downward appear to share this greater freedom, in contrast to those diagonals which run an upward course.

But the form of the diagonal movements is by no means uniformly curved. There are upon occasion most beautifully straight movements here, and when the path is curved it is by no means always of the form described by the law in question. It often shows a double curve of slight degree in passing out from the primary position, and even more often runs most of its course along a hardly appreciable curve and then toward the close increases its curvature, like the form of a golf or hockey stick. But even in the same person such curvatures may, in successive experiments, turn in the very opposite direction.

While it is impossible to give any particular form as that to which these motions universally conform, yet there seems to be a strong tendency for the eye to take a course which shows at first too strong an action of the muscles on the inner or nasal side of the eye; so that those curves which

occur, whether in diagonal or in vertical movements, tend to have a different bend according as the record is made by the right or the left eye. The right eye tends to swing at first too far to the left; the left eye, too far to the right; and this error in direction requires toward the end of the course a corrective jerk or glide, which determines the form of the curve. Accordingly, under the particular conditions of the experiment, these tendencies might be set forth in the accompanying scheme (Fig. 1). It is to be understood, however, that such a diagram

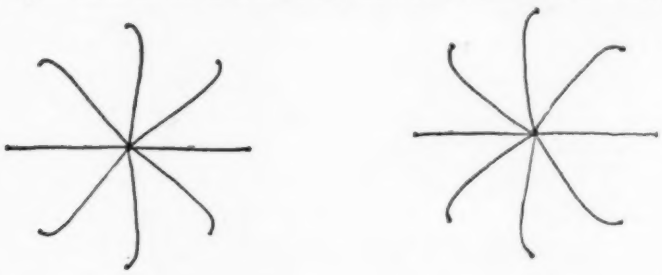
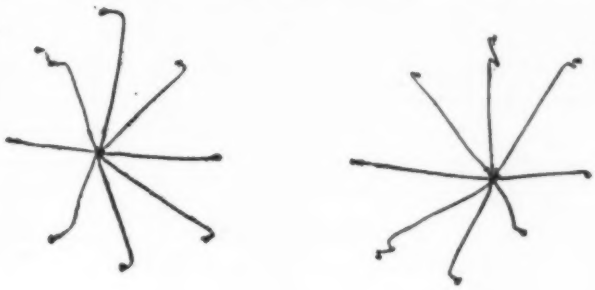


FIG. 1. Schematic representation of the eyes' action; *A* for the left eye, *B* for the right.

is not a picture of the eye's actual paths. For the records themselves are almost invariably more irregular than the curves just given, and at times show no such curvature as is here represented. The selected records shown in Fig. 2 will make this clearer. But that the tendency above described runs pretty strongly through the results is shown by the following distribution of the individual paths in all those directions which, according to the scheme, should show any particular direction of curvature; that is, in all but the horizontal directions of movement:

Subject.	Cases Opposed to the Scheme.	Indifferent and Ambiguous Cases.	Cases in Accord with the Scheme.
B.	5	4	37
D.	4	5	32
N.	5	5	22
Wi.	3	3	21
Wr.	3	1	37
Totals.	20	18	149

A careful examination of the indifferent and ambiguous cases, as well as of those opposed to the scheme, shows that they are distributed about equally between the two eyes and are not concentrated upon any particular direction of movement,



A B

FIG. 2. Records of the eyes' free movements in passing outward from a central fixation point to outlying points in eight different directions. *A* gives the paths of the left eye; *B*, of the right. The actual records were about one fourth this size.

although the four diagonal directions show more of these exceptional cases than do the two vertical directions, and upward diagonals show more exceptions than do the downward.

The direction of curvature in the general scheme I have given is exactly what one might expect to obtain if the eyes in passing from the center of the diagram had relaxed their convergence, but relaxed it more rapidly during the later stages of any given movement than during the earlier stages. Now in the case of the diagram used with subjects *D*, *N*, and *Wr* and described on p. 84, the line of sight when directed to the central point whence all the motions took their start, was perpen dicular to the plane of the diagram, so that the outlying points of the diagram were slightly farther from the eye than was the center. Consequently there was need of some change of convergence in passing from the center outward. But the actual amount of curvature in the records, in the case of those movements in accord with the scheme, is found by careful measurement with a comparator to be, on the average, over four times

what could be accounted for in this way; so that it seems improbable that the greater distance of the outlying parts from the eye could have had much to do with the results.

But to gain more direct evidence as to the possible influence of this factor, the diagram was modified in the experiments where *B* and *Wi* were subjects. The same eight directions were still used as hitherto, but the outlying points of fixation — the *termini* of the eye's sweep, — were now no farther from the eye than was the primary or central point of fixation, — the starting point of movement. The intervening stretch between the central and the peripheral points was a curved extent like a portion of the surface of a sphere at whose center the subject was placed. The continuance of the typical curves under the conditions (as shown by *B* and *Wi* in the preceding table) makes it clear that the mere flatness of the original diagram and consequent need of relaxing the muscles of convergence as the eyes passed outward on the diagram was not the cause of the results obtained from the other objects.

Nor can the direction of curvature be accounted for by the distortion due to the fact that we are recording, not the actual movement of the eye, but the movement of a point of light which is a 'function' of the eye's own motion, since the reflection is from the curved surface of the cornea. Series of photographs were taken while the subject fixated in succession rows of points arranged in lines along each of the eight directions of the regular diagram, as shown in Fig. 3. A specimen record of the left eye is given in *A* of Fig. 4, while *B* is a record of the right eye of the same observer. It is clear from the records that if the eyes took *straight* courses in the eight different directions, one would obtain records showing a curvature similar to that made by the series of dots in these figures produced by the successive fixations of points which lay in straight lines. On the other hand, insofar as the eye during a free movement makes a record different from such a curve, we

FIG. 3. Diagram for showing, by successive fixations, the character of the corneal distortion.

know that the eye at that time *did not* take a straight course, but a curved one. And by comparison we may know in what direction and to what extent it departed from straightness. Now when we compare *A* of Fig. 2 with *A* of Fig. 4, and also compare the *B*'s of these two figures, we find that the free paths of the eye as shown in Fig. 2 are very different in character from the curvature produced merely by the corneal distortion. Indeed in most instances the paths in the one case have an opposite curvature to those in the other.

As to the cause of this characteristic curvature, the results indicate that in free movements of the eye the *rectus internus* muscle is inclined to act too strongly, partly no doubt by reason

FIG. 4. Records of the eyes' action in fixating the points in Fig. 3. *A* is the record of the left eye; *B* of the right. The character of the corneal distortion is made clear, while the paths between stops show that for short movements there is the same general curvature as for the larger sweeps of Fig. 2. The records are from the same subject as are those in Fig. 2, and were taken under like conditions.

of its relatively great size and strength, and partly perhaps because of an association which has grown up between convergence and attention to objects close at hand, so that the act of attention inclines us to call the muscles of convergence into play.

But why the results here show such a departure from those obtained by Lamansky and by Wundt I am almost at a loss to say, and can only offer the suggestion that their methods did not report with exactness the nicer features of the eye's behavior. When the form of the after-image of a streak of light is used to infer the eye's course, in the experiments which I have tried with this method, the path of the eye when its line

of sight is farthest from the light which produces the after-image is very difficult to examine, since the after-image is then too faint and too far out upon the periphery of the retina to be seen with perfect distinctness. And it is when the eye is far out upon its course and is approaching its terminus that the most marked curves in its course usually occur. Moreover, as Hering has pointed out,[1] the path of the after-image is apt to be modified by torsion of the eye during movement, and only under certain special conditions is it a record, pure and simple, of the course taken by the line of sight. But if, instead of using the after-image, one depends upon catching sight of certain objects during the flight of the eye (as Wundt aimed to do), and from their position inferring what the eye's path must have been, then it must be remembered that the eye would be able clearly to recognize such objects only when it *made stops*.[2] Such a method would give no indication of the path pursued by the eye *between stops*, and it is just here that the characteristic curves occur. It would seem to me, therefore, that the photographic method is the one which can be relied upon here to give a more accurate report of the facts.

II. Eye-movements and the Classic Linear Illusions.

The illusion figures that were chosen for photographic tests were those of Müller-Lyer, Poggendorff and Zöllner. And the general method of experiment was to take pairs of records, one of each pair being taken with the illusion in some one form or direction, while its mate was taken during observation of a diagram whose main lines had actually the same length and direction as before, but with the illusory effect in this case either suppressed or reversed. If eye-movements are actually the source of these illusions the records ought to show a difference regularly in the two members of each pair of negatives.

In examining the plates, care was taken to avoid any effect that bias on my own part might produce. Each plate was measured and adjudged in entire ignorance of the more exact conditions under which it had been taken, — as to whether it

[1] Hering, *op. cit.*, pp. 450-451.

[2] Dodge, Psychological Review, VII., 454.

represented, for example, an illusory shortening or lengthening of a line, or an apparent convergence or divergence of parallels. A microscopic comparator was used for much of this work.

The actual outcome of the examination of the records for the Müller-Lyer diagrams is that in most cases the eye takes a wider sweep when the line seems lengthened than when it seems shortened. We cannot say, however, that the eye invariably behaves in this way. Of the eight successful pairs of plates with this particular figure, five pairs show the eye as making a longer or shorter excursion according as the figure itself seems longer or shorter. In three pairs this tendency does not appear. But of these three exceptional cases, two are ambiguous and might be cited either for or against the doctrine that the illusion follows the eye-movement, according as we measured the widest range of the eye's sweep, or merely the distance between the extreme points of *rest*. In only one instance does the eye behave in unequivocal opposition to the requirements of the eye-movement explanation of this illusion.

In the case of the Poggendorff illusion, there is a somewhat different turn to the results. There are here twenty-two clear records, equally divided between instances where the regular illusion-figure was presented and instances where the observer looked at a diagonal having the same length and slant as the diagonal in the Poggendorff figure, but without the interruption and the parallels which in the regular figure influence our perception.

One who examines the negatives in ignorance can have no certainty, in any given case, as to whether the observer had before him the single continuous line or the full Poggendorff figure. Of the eleven pairs of negatives, six pairs show characteristics that favor, more or less, an eye-movement explanation, while five of the pairs do not countenance such a view. In one case, where the illusion came out clear for the observer, the eye made the jog which the eye-movement theory requires, but made it in the wrong place. In another instance where the illusion came out clear, the eye made its jog, but in exactly the wrong direction. And of the eleven records taken with the illusionless straight line, six show jogs of the character that

would explain an illusion if an illusion had only been there. There could hardly be stronger evidence that the jog in the eye's course cannot be the cause of the Poggendorff illusion.

As for the Zöllner illusion, I have but eight clear records and even these are by no means as easy to adjudge as might be expected. The eye is, in reality, an unruly member, and its wild doings are difficult to describe in geometrical terms. In the present experiments (which were with a single pair of parallels from the Zöllner pattern), one would like to say that in just so many cases the eye's movements diverged when the illusion itself was divergent, and in so many instances it converged. But when one tries to bring the reluctant records under such a classification, he finds that in those instances where there is an approach to parallel sweeps of the eye, the very same plate may show one pair of movements convergent and another pair divergent. Or again the eye's motions may be such a medley of pot-hooks and figure-eights that nothing but the points of rest of the eye seem to bear any intelligible relation to the direction of the lines in the diagram observed.

In the case of five plates it is possible to make from the paths themselves a more or less satisfactory estimate of the relative directions of the movements. And of these five cases, two show movements in accord with the direction of the illusion, while three show movements that are self-contradictory — *i. e.*, movements now in accord with the illusion and now in opposition to it. All the plates however permit a rough estimate by means of the points of rest of the eye; and of the eight cases, three show the rests as having a convergent relation with a convergent illusion, while five plates show a divergent relation with a convergent illusion. It is very significant, too, that in the four instances when the observers reported that the illusion came out with greater clearness, half of the plates show conformity between the eye-positions and the illusion, while half show direct opposition.

The general effect of an examination of such records is pretty clear. In the first place, there is some degree of antecedent skepticism produced by the fact previously reported, that — try one's best — the eye is unable to move with any nice con-

formity to an objective line; and that even its points of rest are far from having any exact connection with the form observed; so that one who becomes familiar with such records is more and more impressed with the general unfitness of eye-movements to serve as the basis for the miraculously fine visual estimates and discriminations which we are able to make.

Nor is this antecedent doubt quieted by the present experiments especially directed to space-illusions. If some special form of the eye's movement is the cause of a particular illusion, such a movement must be present on every occasion when the illusion is felt. But in the actual records we find plenty of instances where the movements which have been supposed to produce a given illusion are present when the illusion is absent, and absent when the illusion is present. One can hardly believe, then, that the supposed causal connection really exists.[1]

For we cannot longer argue that although the peculiar movements which are said to be the cause of the illusion may be wanting, yet such movements are *suggested* and have the same effect as if they actually occurred. For while a suggested movement might perhaps be psychologically potent when the eye is at rest, it is unreasonable to believe that such a merely suggested movement could mentally outweigh a movement of the very opposite character which was not suggested merely, but was actually being performed. The Poggendorff illusion can come out clear when the eye is making a movement the very opposite in character to what is theoretically required; similarly the Zöllner illusion; so also the Müller-Lyer illusion. Indeed the performance of the theoretically inappropriate movement is good evidence that the opposite character of eye-movement could not have been very strongly suggested. The evidence as a whole, then, is strongly against the truth of the eye-muscle explanation of these illusions.

With this, let us pass to the final topic to be considered, namely:

[1] One should add, however, that a causal connection quite the opposite to that so often held is not at all unlikely. For instance, in the Müller-Lyer illusion, it may well be that the relative lengths of the eye-movements are not the *cause* of the illusion but are its *effect;* the line which seems long tends to call forth a long sweep of the eye, while the apparently short line induces a short sweep.

III. Symmetry and its Relation to Eye-Movements.

The figures here used were, in part, the simplest — squares, rectangles and circles; and, in part, more complicated figures, the outlines of Greek vases, with and without symmetrical handles. In these experiments care was of course taken to give the various observers no hint that the symmetrical arrangement in the figure was the special feature under investigation. They were merely told to look at the figure in whatever way seemed to them right and natural, and, if possible, to observe the form as one would in enjoying it.

In examining the negatives one is struck by the almost grotesque unlikeness between the outline observed and the action of the eye in observing it. For the most part the eye moves irregularly over the figure, seeking certain points of vantage from which the best view of important features may be obtained. And these positions are marked by the eye's momentarily resting there. Now these points of rest are evidently of more consequence to the observer than the path by which the eye reaches them; indeed the form of any single path between two stops usually bears no observable resemblance to the outline which the subject was taking in, and which in many cases he believes his eye to be accurately following. But even the points of rest are not so arranged as to supply of themselves a rough sense of the form perceived, after the manner of an outline pricked disconnectedly in paper. The points of the eye's rests in the records are usually too few and too inexact to give any such clear and connected perception of the form as the observer regularly and readily obtains.

As regards the question of the symmetry of the movements of the eye, in some instances the negatives display a rude balance. But it must be said that even the most symmetrical of these records can be called so only by courtesy, for they signally lack that exactness of correspondence of part to part which we demand in the objective form before we are ready to enjoy it because of its symmetry. The more frequent records have not even this rough approximation to symmetry.[1] The

[1] For an example of such a record, see my *Experimental Psychology and its Bearing upon Culture*, p. 242.

observer looks at one side of a Greek vase in detail, and then glances at the other side, and, seeing that it corresponds to the first, is satisfied. By comparing the records with the reports of the observers, it would appear that some of the more symmetrical eye-movements occurred when the person was in doubt as to whether the form before him really was symmetrical. So that balance of ocular sweep may be obtained where the symmetry is doubtful, and where the observer must look closely and compare the sides part by part. But looking for symmetry is psychologically a different thing from enjoying symmetry; it is a condition of dissatisfaction and unrest. And on the other hand observers have expressed especial satisfaction with a vase-form where the record revealed movements unusually ill balanced.

The records do not warrant one, however, in saying that with pleasing forms the eye tends to a kind of equipoise where motion no longer is invited. It has been thought by some that this constitutes the chief pleasure in symmetry — that the eye is drawn equally in opposite directions, and in the presence of opposing forces finds repose. The actual experiments show, it is true, that the eye may at times make relatively slight movements in viewing a graceful form. It may take up some central position, and keep its excursions within a small compass. But even here there seems to be an almost ceaseless twitching, as if rest for more than an instant were the one thing not to be endured. Ceaseless movement seems to be the natural state of the eye, as it is of the attention, and pleasure is found only in this normal state.

The sources of our enjoyment of symmetry, therefore, are not to be discovered in the form of the eye's behavior. A figure which has for us a satisfying balance may be brought to the mind by most unbalanced ocular motions; and during the more symmetrical movements of the eye the observer may have been disquieted by the sense that the figure was decidedly out of balance.

The present experiments, therefore, help to clear the ground. They make it easier for us to see that the explanation of a phenomenon which has its blood-relations in the field of every one

of our senses ought not to be sought in conditions that are confined to any single sense. Linear symmetry is vitally connected with such varied facts as the repetition of a figure in a dance, or the refrain in song, or the working up of a theme in symphonic composition, where the same melodic phrase may be given, now on the strings and now upon the wind instruments, or may without change of instruments be given now with one and now with another harmonic setting. Such a musical translation is not so very far from what we have when a right-hand linear arrangement is given a corresponding left-hand form and the two are joined into a single figure.

Those who in explaining these things would say little or nothing about eye-muscles and would say much about the muscles of the limbs and trunk and viscera — such persons would seem to me to be upon ground from which it would be more difficult to dislodge them. There is no occasion here to follow this other side of the theory which pins its faith upon muscular sensations. The discussion of the present experiments has been intentionally confined to the point of showing, not that they disprove any muscular theory whatever, but that they tend to make the eye-muscles appear a trifle ridiculous when one compares their actual performances with the marvels which have been attributed to them. The mythology of the eye-muscles will some day make an interesting paragraph in the history of delusions in psychology; and we shall not be long, I expect, in gaining the facts which will permit this mythology to be recognized and narrated.[1]

[1] The MS. of this article was received December 20, 1905. — ED.

ON SECONDARY BIAS IN OBJECTIVE JUDGMENTS.

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I.

The scientist sets before himself the ideal of a perfectly impartial account of the external world. In proportion as he frees his work from personal prejudice is its outcome successful. The facts may be unwelcome, they may run counter to his desires and mean the overthrow of long-cherished ideals; but these elements of sentimental valuation have no place in the world of scientific truth; except, indeed, as themselves matters for investigation and record like all other phenomena. To suppress facts because they are at variance with an already accepted theory, or to warp them in the direction of a desired interpretation, means the destruction of science; it is a denial of the possibility of a system of objective knowledge. For it is the effort of science to transcend the limitations of the individual and to establish those principles which are independent of subjective bias and form the body of truth common to all observers.

Deliberate distortion or suppression of facts the scientist does not discuss. One guilty of such acts manifests a purpose which is radically distinct from that of the investigator. The scientist presupposes sincerity of purpose in the observer together with honesty and reliability in the record, in so far as these results are dependent upon the intention of the investigator. Honesty of purpose, however, is but the starting-point of accuracy in the record; and the advance of science has involved at every stage of its progress a renewed criticism of the conditions of observation, and an investigation of the possible sources of error to which its methods are liable.

The personal or psychological factors of distortion which thus appear in the report of an external event by any observer

may be grouped in two classes, physical and mental. The first of these embraces all the external conditions of observation, including the mechanisms of perception; the second consists of the various sources of unconscious bias which inhere in the intellectual processes of the observer. The former are relatively stable and of comparatively easy correction. The computation of their values is always incidental to the presentation of results. Such are the correction for time and space differences, the calculation of probable errors, the establishment of the observer's personal equation, and the like.

Errors of the second class are of a different nature. Their character is peculiarly personal and unpredictable, their range undeterminable and their value largely unquantifiable. The existence of such subjective bias in any given case may be assumed, but its direction and amount can only be estimated in the roughest and most general way from an acquaintance with the mental habits of the observer. And even this correction can be applied only to certain large features of a man's work, such as his philosophical interpretation of scientific data. In a multitude of cases it is wholly impossible to estimate the correction which should be made in an individual report, or even to guess at the nature of the factors which are operative in the process of subjective distortion; and though the error thus introduced is commonly trivial it may rise on occasion to great and tragic importance.

To give an unprejudiced account of any event is a practical impossibility. It takes shape within each individual consciousness in dependence upon the dominant system of values and modes of organization which that mind possesses; and the variations in the reports given by any person and his fellows will be proportional to the differences in interests and habits which exist between them. These variations need not present discrepancies, — though they commonly extend even to contradictions — but may involve only changes in proportion and emphasis. It is notorious that the violence of the external stimulus alone does not determine the intensity or permanence of the impression which is made upon consciousness in any given case. The general habit of attending to such stimuli and the

openness of the mind at the moment are more important factors than the absolute magnitude of the stimulus. In other words, selective attention working under the guidance of our organic interests operates upon the materials and processes of the external world, adding accentuation and emphasis, seizing upon and preserving certain elements which we call pleasing or important, and relegating the rest to obscurity or oblivion. Often the account in which this recasting results is unrecognizable by a fellow-observer of the event. The existence of subjective bias is thus not an incidental error in our observations but is fundamental to the very character of the human mind. We can conceive its elimination only in an absolutely dispassionate consciousness devoid of feeling and purpose.

This universal bias roots in the fact that at each moment of our experience some one interest is for the time being paramount, and determines both the objects which shall be attended to and the interpretation which they shall receive. The nature of any reality with which the mind concerns itself, whether objective or subjective, is as much affected by every change in this system of inner relations into which it is woven as is the appearance of a physical object by being overturned and regarded from a new point of view. One may identify the object with that of the moment preceding, but at best it is the same with a difference. A new set of angles appears and its relations with other things have changed. The type of new crystallization within the mind has given the object a fresh meaning through the introduction of a novel system of emphases, and its character as a mental object has thereby been transformed. The very hold which an impression or idea has on the mind depends upon the existing system of relations in which it is caught up, and which is expressed in the temporary or permanent disposition of the mind. It must in some way fit the purpose of the moment or appeal to an organic habit if it is to take intelligible shape before consciousness. While reading a book, for instance, one disregards wholly the width of the margins, the smoothness, rigidity and rectangularity of the covers, and the weight of the volume, any one of which might, on another occasion, be the important aspect to take into account in considering the object,

if one were in search, say, of a paper-weight, a straight edge, a writing-pad, or wished to make marginal comments upon the contents. The perception of symmetry in visual forms, again, expresses the fact that the mind wills to attend only to those lines and masses which present geometrical balance; for in every such design the possibilities of unsymmetrical construction are incomparably more manifold than those of the regular systems upon which the eye dwells, and the apprehension of the latter depends upon an ignoring of all that is formless or disproportionate, which can be referred only to the organic disposition of the perceiving mind itself.

This subjective selection and emphasis pervades all mental activities, perceptive, imaginative and rationalizing. It is expressed alike in the construction of an orderly world of objects and space relations to which our senses give rise, and in the determination of the course of ideal association in our purposeful thinking. But this universal aspect of human consciousness once acknowledged, we are no longer concerned with its existence. It is as proper to point out that it is the basis of intelligibility in the world and of a rational adjustment to its changes, as to recognize that the apprehension of that world varies from moment to moment in dependence upon transitions in the point of view and present purpose of the beholder.

It is only when a bias of the second order appears that the detection of the presence and magnitude of the errors involved assumes practical importance, when our types of confessedly selective perception and representative thought are distorted by factors of evaluation of whose presence we are unaware at the moment of judgment. Such are the familiar space and time errors of which account must be taken in reducing observations involving position and movement, or comparisons of events in serial order. Such are also the sources of unconscious prejudice which influence personal opinion of men and events.

The interest of the psychological student in these phenomena does not concern the mere fact of their existence. The presence of such modifying influences may be presupposed in all cases; they are pervasive as gravitation. The judgment made at any given moment reflects, in a way, the whole system of

stimulations, inner as well as outer — which is operative in determining the cast of the mind at the moment. One's judgment of the comparative intensity of a sound, for instance, depends upon both the character of the auditory impressions which have just preceded it, and the whole system of stimuli acting upon the senses at the moment time; as well as upon the physiological activity of the body and conditions of attention and alertness on the part of the subject.

The same holds true of all judgments concerning the qualities and the relations of objects in the world about us; and part of the work of the psychological observer is of course to determine for all important modifying influences of this kind the typical curves of value which they manifest in connection with a series of systematic variations in their concomitants. The investigations of color-contrast, of hetero-sensorial reinforcement, of the influence of distraction upon judgment, are cases in point.

One approaches a more obscure and difficult problem in passing from investigations of sense perception and memory to judgments based upon conceptual processes, or comparisons of objects so complex that many significant relations exist between them and the mind which judges. Especially is this the case with all humanly real objects, those, namely, which do not simply receive a fictitious existence in the laboratory, conferred for the direct purpose of affording material for the judgment in question, but which are reacted upon naturally and seriously because they enter into real relations with the practical business of life. In the latter case every significant point of view from which the object has ever been regarded becomes a possible source of secondary bias; its practical, its political, its æsthetic, its historical, its religious value — each and all may affect one's judgment of even its immediate physical characters.

We exaggerate the size of our gods and heroes, making them "larger than human" not only because the conception of bodily prowess so frequently lies back of the thought, but also because the estimation in which we hold their political or moral significance tends to be reflected in our representation of their bodily appearance. The example is but an illustration of a class of effects which, as in the former case, we may presume

to be present, in some form or other and to some given extent, in all such judgments. The important and familiar places of the world, for instance, we should probably find to be located by each person at points on the average nearer to himself, and places historically or politically obscure at points more distant than their actual geographical positions. In exemplification of this general class of effects I have been at pains to determine the existence and influence of certain forms of such secondary bias in a single selected series of cases, the results of which are presented in the remainder of this paper.

The inquiry arose from a discussion of the variability of individual judgment with regard to the comparative weight of bank-notes and coin, and the sources of constant error which affected such estimation. The raising of this question led Dr. J. F. Messenger to institute an inquiry the results of which were published in the form of a note in *Science*, April 25, 1902. In his report the writer commented upon three things, the comparative accuracy of judgment in the two sexes, the amount of the constant error involved, and the influence upon such judgments of the symbolic value of the bills in question. With the last of these points the present inquiry began, as preliminary to the larger series of comparisons to be reported later in the paper. The question to be answered was of the simplest character: How many bills together equal the weight of a silver dollar? This question was asked concerning two denominations, one-dollar and ten-dollar notes.

It was impossible to ask for judgment on these two points consecutively of the same person, consistently with the object in view; since the naïveté of the subject's attitude which is essential to the success of the inquiry would thereby have been destroyed, and the calling of attention to the point in question would certainly result, though in an unpredictable proportion of cases, in a rectification of judgment, and the elmination of that very error the presence of which in uncritical judgments was the matter under determination. In order to approach the question it was therefore necessary to obtain reports from two groups of observers, taken as nearly as possible from the same class of subjects, and in sufficient numbers to offset the disad-

vantage occasioned by the lack of direct comparison between judgments made by the same individual. Those to whom the question was put were all public school children of the five upper grades. The selection of this class of subjects arose partly from its accessibility, partly from the desire to note any changes in the character of the judgments which appeared in connection with advance in age. Comparison of the judgments made by the two sexes will have to be reserved, as answers have hitherto been received from classes of girls only. The observers were all pupils of a single school, of such a size that each of the grades in question was subdivided into sections, and the two inquiries were made alternately of these groups. The total number of answers received, — exclusive of those cast out on account of defect — was 646, distributed as follows:

TABLE I.

Grade.	One Dollar.	Ten Dollar.	Total.
IV.	67	56	123
V.	155	116	271
VI.	78	66	144
VII.	40	42	82
VIII.	15	11	26
Totals	355	291	646

Of this total the last group of 26 should probably be put aside in considering the results, as the number is too small to form the basis of any reliable conclusion in regard to a question in which the index of variability is so high as it is here.

The average numbers of bills of each denomination judged to equal the weight of a silver dollar by pupils of the various grades are as follows:

TABLE II.

Grade.	One Dollar.	Ten Dollar.	Average.
IV.	215	125	170
V.	98	97	97
VI.	99	44	71
VII.	84	52	68
Average.	124	79.5	101.5
VIII.	112	122	117

The returns from the small group of eighth grade pupils which appear at the bottom of the table, have not been included in making up the averages. The remaining figures show a considerable preponderance, for the whole series, and in each grade at least an excess, in the number of bills of the lower denomination over that of the higher which is judged to make a weight equal to that of a silver dollar.

When the individual variability is so high as to include extremes of five, and twice as many thousands which appear in these guesses at the weight of a banknote, it is only when a decidedly large group of answers is taken into account that the average possesses any real significance. The ratio presented by any single grade may therefore be held undecisive; but the fact that the average number of one dollar bills is greater than that of the tens in the ratio of 24 : 79.5 when the whole series of 600 comparisons is considered, may be taken as settling at least the question of the presence of this factor of secondary bias in judgments of this nature.

Whether the prevalence of this type of confusion tends to increase with age the present figures can hardly be said to show, though the evidence which they afford is favorable to such a conclusion. The intimacy of the association between the perception of a bill of any denomination and its representative value undoubtedly increases as one's familiarity with the use and exchange of money grows. Without this experience the source of error which appears in these judgments would of course not exist, and it is during the years comprised within the present series that the child acquires this knowledge. It may be said, therefore, that the factor upon which the distortion of judgments depends is taking on greater reality and importance during this period, and that a progressive increase in the error might be looked for. It is also true that if the series of four grades be divided into junior and senior groups, the error in the latter will be found nearly half as great again as in the former. Nevertheless the construction of such a curve demands both the determination of a large number of points and a more consistent sequence among them than is here presented.

Another developmental feature, it may be noted in passing, is

fairly well-marked in these papers. The number of bills which equals the weight of a silver dollar, if we regard the quantitative average solely, is consistently exaggerated, since its actual value is about twenty; but the amount of overestimation is successively reduced from grade to grade, as appears from the series of averages which is attached to Table II. in the last vertical column. The judgment of the child concerning the weight of bills in general is undergoing the progressive rectification, at the same time that the element of secondary bias is, or may be, increasing.

In any such case as the present, however, the figures already given leave one largely in the dark as to the real distribution of the guesses. We need to know the constellation of the judgments as well as their quantitative averages. The mean of the series, which is the index of this distribution, is given in the following table for each grade and denomination separately:

TABLE III.

Grade.	One Dollar.	Ten Dollar.
IV.	20	20
V.	25	25
VI.	25	20
VII.	50	25
VIII.	100	120

These figures suggest comparison with the results obtained by Messenger, and by Pierce (*Science*, Nov. 7, 1902, p. 745) from college students and other grown persons. In the first of these reports the average (of all judgments) was 201 times and the mean 8 times the actual number involved. In the second (Dr. Pierce's group) the average was 15.8 times and the mean 4.3 times too great. In the present series the average for the four grades considered is 10.2 times and the mean 1.3 times the actual number. The data are perhaps not sufficient as regards numbers for a valid comparison of the two series of judgments and lack continuity through the intervening ages; but the results of the observations so far accessible (based roughly upon 600 reports in each case) do at least show a striking difference in the correctness of the estimates made by school children from

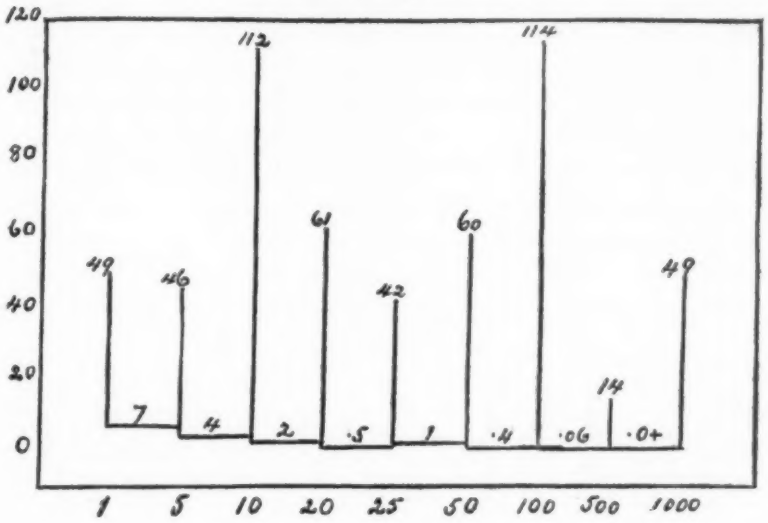
nine to fifteen years of age, in the present series, and by college students or more mature persons, as reported by the two investigators already quoted.

If the two sets of figures representing the quantitative average of the mean value of the median estimate for successive years be compared they will be found to present inverse relations. The average is steadily reduced with age, the mean is progressively increased. Of these two series the change in the first indicates only the elimination of scattering judgments which show an uncritical and excessive estimate. A larger and larger number of the children, as they grow older, are coming to have a more or less intelligent idea of the relations of weight between the two objects. But these averages do not necessarily mean that a more accurate apprehension of their comparative weights is being developed among the members of this group themselves. It does not even show the character and changes of the constant error, if such exist. The index of the latter is found in the series of median values; and these show that while the correction of extravagant misjudgments is steadily lowering the quantitative average of the series, the tendency of the majority of observers to underestimate the weight of the bill is progressively mounting. If we may take the present results and those with which they are here compared as typical — and the averages in each of the two cases are based roughly upon 300 individual judgments — the perception of the child — in these matters is much more accurate and free from prejudice than that of the grown person; and there is reason to suppose from that part of the curve which the present investigation affords, that the carrying up of the reports through the intervening years would show a fairly continuous series connecting these extremes of judgment.

It may be worth while to call attention to another form of secondary bias which these estimates of weight present. It appears in the distribution of individual judgments in relation to odd and even numbers, and to decimal nodes, or 'round numbers.' Out of the total series of judgments even numbers were given in 517 cases, odd numbers — exclusive of unity and multiples of five — in 16 cases only. This preponderance arises

from the frequency of even tens, hundreds, etc.; the occurrences of unity and odd multiples of five amount to 166, while the total number of five-multiples is 590.[1] This clustering of the judgments about decimal nodes and semi-nodes is shown graphically in the diagram (Chart I.), in which the height above zero of the vertical lines indicates the frequency with which the

Chart I.



numbers at their bases occur in the returns, while that of the horizontals between them represents the average for all the intervening numbers. For further elucidation the numerical values are put above their respective graphical indices.

The guesses may practically be said to consist of ones, fives, tens, etc. The whole series of intervening numbers is represented by only one judgment in seven. Of these maxima, '10' and '100' occur with more than twice the average frequency of the rest. The falling off in the '1,000' judgment is due to the

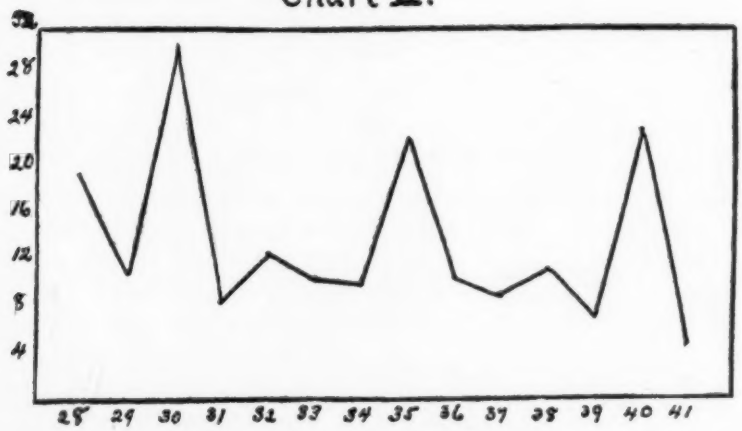
[1] In this later reduction only unintelligible papers were cast out, whereas in the former case all but those which were wholly unambiguous were rejected. For instance the answer '20 or 30' was now retained though previously eliminated. The total number of observations, therefore, appears greater than before.

small total number of guesses which reached this magnitude, but the attraction which 'round numbers' possess is shown by the fact that though this point lies near the upper limit of distribution, the number of cases in which '1,000' was given as the estimate is three times that in which '500' occurred.

For comparison a second diagram (Chart II.) is appended in which I have represented a set of figures given in a paper by A. Williams in the *Scientific American Supplement* for March 16, 1889, entitled 'Favorite Numbers.' These figures were taken from the preceding United States census, and indicate in terms of thousands the number of persons in Alabama who reported themselves to be one of the ages named at the bottom of the chart.

The strongly marked maxima at 30, 35 and 40 years need not be pointed out, but it should be noted also that, as in the

Chart II.



present series of judgments, the maxima at the even tens are higher than at the intervening fives. The peculiar form of this curve must of course be wholly due to subjective distortion, and the more abrupt contrast between the maxima and intervening low plateaus in the preceding diagram is due to the greater freedom of choice in estimating the weights than in reporting ages. It is to be expected that in the upper tens, for example, one should put the number at 70 rather than 69 or 71; but the

fact that a similar constellation appears among the series of estimations running from unity to ten shows clearly the existence of this preference for particular numbers. The sum of the judgments distributed among the numbers one, five, and ten is 207, while the aggregate for the other eight is but 44, or one twelfth as many to each number.

III.

The purpose of the main investigation, like that already described, was to determine the influence exerted by secondary associations upon one's representation of the physical qualities and relations of objects. The special associations which guided the selection of individuals were those of political and historical importance. An exact order of precedence in such a case cannot of course be established, since the valuation is subject to fluctuations dependent upon the individual who passes judgment upon the returns, but at least the whole series may be divided into two groups according as the objects contained in them have more or less importance of the kind in question, and comparison may roughly be made between the upper and lower regions of this scale.

Four series were prepared, each consisting of ten objects concerning which judgment was to be made, and the members of these series were to be arranged according to what the observer conceived to be their real order. In cases of doubt bracketing was to be avoided and the two or more objects put in serial order, even if recourse to guessing was necessary. The adoption of this method in such exceptional cases was based upon the presumed existence of preference even in an allotment of this kind; but when the uncertainty extended to many of the series this recourse would serve no good purpose, and the observer left the returns uncompleted or untouched. As the differences among the objects were fairly large and the order merely relative the occurrence of imperfect lists was rare, and all these were cast out in making up the returns.

The papers were first submitted to two university classes, consisting of 55 women and 19 men of mature age; they were then sent to the Principals of five New York public schools and

were marked under their supervision by 204 pupils distributed as follows:

TABLE IV.

Age.	11	12	13	14	15	16	Total.
Boys.	8	16	28	13	2	—	67
Girls.	—	11	40	43	25	18	137
Total.	8	27	68	56	27	18	204

In the first list ten of the countries of the world were arranged in alphabetical order and the observer was asked to give judgment of their territorial extent, putting the figure (1) before the largest, (2) before the next, and so on in order of size. In computing results the returns were entered one beneath another on a sheet of paper, the series in each individual return running horizontally from one to ten. The average position assigned to each country was then determined by dividing the sums of the several columns by the number of reports received, and the direction and amount of error was recorded in terms of plus and minus deviation from the true position of each in the series. Countries were marked plus (+) when the position assigned was too high in the scale, minus (−) when it was too low. The following illustration will obviate the necessity of referring again to the method, which was followed in reducing all the returns:

TABLE V.

SCHOOL C; GRADE 7B, GIRLS; AGE 13 YEARS. LANDS.

A, Actual Order; B, Average Order Assigned; C, Error of Displacement.

A.	4.00	8.00	5.00	7.00	6.00	10.00	3.00	1.00	9.00	2.00
B.	8.14	8.58	2.92	7.00	5.33	6.42	5.92	2.00	7.50	1.25
C.	−4.14	−0.58	+2.08	±0.00	+0.67	+3.58	−2.92	−1.00	+1.50	+0.75

The returns from university students are classified below, the alphabetical order in which the names were arranged in the original list being replaced by that of deviation, the series beginning with the highest overestimation and ending with the greatest underestimation which occurs:

TABLE VI.

Countries.	Men.	Women.	Average.
Palestine,	+ 2.3	+ 2.3	+ 2.3
German Empire,	+ 1.9	+ 2.0	+ 1.9
Switzerland,	+ 0.2	+ 1.2	+ 0.7
Italy,	+ 0.5	+ 0.6	+ 0.5
United States,	+ 0.6	+ 0.2	+ 0.4
Ceylon,	+ 0.4	± 0.0	+ 0.2
Siberia,	— 0.7	— 0.7	— 0.7
Iceland,	— 1.3	— 1.1	— 1.2
Afghanistan,	— 1.1	— 1.9	— 1.5
Peru,	— 2.4	— 2.5	— 2.4

In the returns from public school children which follow, the results from the five schools are given separately from their average under the headings A, B, C, D, E, for comparison as to uniformity of arrangement:

TABLE VII.

Countries.	A.	B.	C.	D.	E.	Av.
Palestine,	+ 2.4	+ 3.3	+ 2.5	+ 2.2	+ 2.5	+ 2.6
German Empire,	+ 1.8	+ 2.1	+ 2.1	+ 2.8	+ 2.5	+ 2.3
Switzerland,	+ 0.9	+ 1.5	+ 1.9	+ 2.7	+ 2.0	+ 1.8
United States,	+ 0.7	+ 0.7	+ 0.7	+ 0.6	+ 0.7	+ 0.7
Italy,	+ 0.4	+ 0.7	+ 0.5	+ 0.8	+ 0.6	+ 0.6
Ceylon,	+ 1.1	— 0.7	+ 0.1	+ 0.6	— 0.4	+ 0.1
Iceland,	+ 0.1	— 0.1	— 0.6	— 0.9	+ 0.1	— 0.3
Siberia,	— 1.2	— 1.5	— 1.8	— 2.6	— 2.4	— 1.9
Afghanistan,	— 1.5	— 3.3	— 2.7	— 2.6	— 2.9	— 2.6
Peru,	— 4.2	— 2.8	— 2.6	— 3.6	— 3.1	— 3.3

Both of these tables present a systematic displacement which differs fundamentally in its curve from that to which the presence of scattering errors would give rise. From the middle of the group it rises by progressive increments of opposite signs to extremes which are separated by five places, or half the value of the series. Setting aside the question of detail, it is evident from this distribution that the separation of the system into upper and lower regions reflects the political and historical estimation in which the constituent lands are held. The important countries are overestimated, the obscure underestimated, and if the whole series should be divided into two groups on this principle, all those called important will be found in the upper half of the scale, all the obscure in the lower half.

The comparison can be carried farther; for the amount of displacement of a country roughly parallels its degree of nearness or remoteness in our interest. The strongest evidence of this is the resemblance which exist between the university and school tables, which are identical except for two exchanges in adjacent names, which in one case are separated by one half, in the other by one tenth of a place only. It should be remembered that when a limited series is taken the actual size of the country may modify the predicted curve of displacement; since as the upper limit is neared the number of minus errors will necessarily predominate, and the plus errors as one approaches the lower extreme. This is shown in the case of the United States, in which all the factors of secondary association which predispose to exaggeration are at their highest, while yet the country is overestimated by only half a point. The United States is however second largest in the series, and the error at its maximum could therefore be only unity.

There is another source of secondary bias which might be expected to show in these tables. Geographical distance is commonly associated with remoteness of interest; and where not submerged by other and dominant factors of error, as in a series of cities of the same class, or minor physical features such as rivers, its influence would doubtlessly be discernible. But in the present case the actual distance becomes an insignificant element in view of the facility of information and intimacy of relation which may exist between places far apart. Peru is nearer than Palestine, but is incomparably more remote in every significant application of the term, and a series of ten countries is quite too short to permit the demonstration of any such minor factors of bias.

The second list comprised a series of ten rivers selected from the four continents according to the same principle as in the case of lands. The two sets of results are given in the tables on page 113, university students in the first and school children in the second:

The same general comments are to be made on these tables as on those which preceded. The first six names are the same in the two tables, though not in identical order, and the division

TABLE VIII.

Rivers.	Men.	Women.	Average.
Hudson,	+ 3.1	+ 3.6	+ 3.3
Thames,	+ 0.8	+ 3.9	+ 2.3
Danube,	+ 1.2	+ 1.4	+ 1.3
Rhine,	+ 0.1	+ 1.4	+ 0.75
Douro,	+ 1.3	+ 0.1	+ 0.7
Mississippi,	+ 0.9	+ 0.5	+ 0.7
Mackenzie,	— 0.7	— 1.5	— 1.1
Petchora,	— 1.5	— 1.2	— 1.3
Orange,	— 2.2	— 2.2	— 2.2
Lena,	— 2.7	— 4.7	— 3.7

TABLE IX.

Rivers.	A.	B.	C.	D.	E.	Av.
Thames,	+ 4.6	+ 4.0	+ 4.6	+ 5.4	+ 4.5	+ 4.6
Hudson,	+ 3.5	+ 3.7	+ 4.2	+ 5.3	+ 5.5	+ 4.4
Rhine,	+ 1.9	+ 1.9	+ 1.3	+ 2.5	+ 2.0	+ 1.9
Mississippi,	+ 0.9	+ 0.9	+ 0.9	+ 0.9	+ 1.0	+ 0.9
Danube,	+ 1.8	— 1.0	+ 0.9	— 0.3	+ 1.1	+ 0.5
Douro,	— 0.1	— 1.0	— 0.2	— 1.1	— 0.9	— 0.7
Mackenzie,	— 2.7	— 1.0	— 2.0	— 2.4	— 2.6	— 2.1
Orange,	— 2.3	— 2.5	— 2.2	— 2.3	— 1.8	— 2.2
Petchora,	— 5.0	— 2.1	— 1.6	— 1.6	— 2.2	— 2.5
Lena,	— 6.4	— 4.7	— 6.2	— 6.4	— 6.1	— 6.0

into plus and minus groups is just such as would be made on the basis of historical importance. The Mississippi River, like the United States in the previous list, falls low in the group because it lies near the upper limit of the series, the greatest possible error of overestimation being unity. The greater influence of association upon judgment in the present case, as compared with that of countries, is shown in the range of variation, which here reaches a sum of seven places in one set of figures and ten in the other.

The factor of nearness or remoteness is also perceptible in the estimate of rivers, as appears from table X, in which the series has been rearranged in order of distance from the city of New York where the returns were made out:

In the judgments of both university students and school pupils the members of the nearer group are overestimated on the average 1.3 places, and those of the more distant group underestimated to the same degree. The strong influence of this factor of bias is shown in the fact that it is not only dis-

cernible but pronounced in a series both so short as the present and marked by such a major disguising feature as that which guided the selection.

TABLE X.

Rivers.	University.	School.	Rivers.	University.	School.
Hudson,	+ 3.3	+ 4.4	Rhine,	+ 1.3	+ 1.9
Mississippi,	+ 0.7	+ 0.9	Danube,	— 1.3	+ 0.5
Mackenzie,	— 1.1	— 2.1	Petchora,	— 2.2	— 2.5
Douro,	+ 0.7	— 0.7	Orange,	— 3.7	— 2.2
Thames,	+ 2.3	+ 4.6	Lena,	+ 0.7	— 6.0
Average,	+ 1.18	+ 1.42	Average,	— 1.04	— 1.66

The third set of returns related to a group of American cities, which consisted of the capitals, together with one other place of importance, of five states of the Union. The names, as usual, were arranged in alphabetical order; and so far as came to the notice of the writer no one remarked the peculiar distribution of the cities in question. In the tabulations which follow, first of university students and second of school children, the names are arranged in pairs from each state in order to bring the errors of displacement into a clearer view:

TABLE XI.

Cities.	Men.	Women.	Average.
Albany, N. Y.,	+ 0.3	+ 0.5	+ 0.4
Rochester, N. Y.,	— 1.8	— 1.7	— 1.7
Trenton, N. J.,	— 0.3	+ 0.3	± 0.0
Camden, N. J.,	— 3.2	— 3.6	— 3.4
Harrisburg, Pa.,	+ 1.7	+ 1.8	+ 1.7
Allegheny, Pa.,	— 3.6	— 3.4	— 3.5
Springfield, Ill.,	+ 5.0	+ 3.5	+ 4.2
Quincy, Ill.,	— 0.8	— 0.5	— 0.6
Frankfort, Ky.,	+ 4.1	+ 3.0	+ 3.5
Newport, Ky.,	— 1.1	— 1.1	— 1.1

In both these sets of figures the influence of secondary bias is strongly marked. The size of the capital is almost uniformly exaggerated, while that of the other cities is underestimated. The error of displacement, whose extremes are separated by

almost nine places, is greater in regard to the distant cities, smaller in those which are near, with the exception of Newport, Ky. I can conceive no reason for this wholly anomalous case unless it has been confused with Newport, R. I., the social prominence of which might raise it to a position among the places overestimated. With this exception the second table, like the first, is consistent throughout.

TABLE XII.

Cities.	A.	B.	C.	D.	E.	Average.
Albany, N. Y.,	+ 1.3	+ 1.4	+ 1.0	+ 0.8	+ 1.1	+ 1.1
Rochester, N. Y.,	− 3.4	− 2.5	− 3.3	− 2.0	− 2.9	− 2.8
Trenton, N. J.,	− 0.3	− 0.1	+ 0.3	− 0.2	− 1.5	− 0.2
Camden, N. J.,	− 3.3	− 2.9	− 3.4	− 3.1	− 3.4	− 3.2
Harrisburg, Pa.,	+ 3.4	+ 2.3	+ 1.5	+ 2.5	+ 1.1	+ 2.2
Allegheny, Pa.,	− 5.3	− 5.7	− 3.8	− 4.1	− 4.1	− 4.6
Springfield, Ill.,	+ 3.8	+ 4.8	+ 4.4	+ 3.7	+ 3.7	+ 4.1
Quincy, Ill.,	+ 0.4	− 1.3	− 0.7	− 1.7	− 1.3	− 0.9
Frankfort, Ky.,	+ 3.1	+ 3.5	+ 2.9	+ 3.9	+ 2.9	+ 3.3
Newport, Ky.,	+ 1.5	+ 0.9	+ 1.5	+ 1.1	+ 1.4	+ 1.3

In this series it is useless to look for a demonstrable error of displacement due to distance. The number of cities is altogether too small for such a curve to be seen across the dominant bias of political significance. Were the group enlarged, or taken from cities of the same class, it would undoubtedly appear.

The fourth and final list consists of a series of historical characters, monarchs, statesmen, explorers — belonging to various nations, and covering in their range a fairly extensive period. The observer was asked to arrange these in order of time, with a view to ascertaining whether the important and familiar personages were conceived to have lived in more recent, the obscure and unfamiliar in more remote times than those in which their lives actually fell. The results are given as before in order of error quantitatively from plus to minus, the former indicating in the present case an underestimation, and the latter an overestimation, of the intervening period. The first table gives the rating by university students:

The making up of such a list of men presents more difficulties

than any of the preceding series, on account of the variability of their associations not only among individuals but also among groups, in consequence of which the form of the curve is subject to modification by other important forms of secondary bias than that considered in the selection. For instance, it is to be expected that the lines of national relationship should be accentuated wherever the parentage of the observers is relatively homogeneous, or that characters treated in pure literature should present increased bias in the reports of educated and reading subjects. It is probable, in this connection, that the fascination which personages of romance and glory possess for children has raised Harun al Raschid and Charlemagne to the level which they hold in the returns from the public schools.

TABLE XIII.

Names.	Men.	Women.	Average.
Drake,	+ 3.3	+ 2.3	+ 2.8
Champlain,	+ 2.5	+ 1.5	+ 2.0
Joan of Arc,	+ 1.3	+ 2.0	+ 1.6
Charlemagne,	+ 1.0	+ 1.8	+ 1.4
Harun al Raschid,	+ 0.1	+ 1.1	+ 0.6
Richelieu,	— 0.5	± 0.0	— 0.2
Franklin,	— 0.3	— 0.5	— 0.4
LaSalle,	— 0.6	— 1.6	— 1.1
Gustavus Adolphus,	— 3.0	— 2.9	— 2.9
Mazeppa,	— 3.9	— 3.7	— 3.8

TABLE XIV.

Names.	A.	B.	C.	D.	E.	Av.
Charlemagne,	+ 3.3	+ 4.4	+ 4.9	+ 3.9	+ 4.5	+ 4.2
Harun al Raschid,	+ 2.9	+ 2.5	+ 4.1	+ 2.1	+ 3.9	+ 3.1
Drake,	+ 1.1	+ 1.9	+ 0.9	+ 2.3	+ 2.5	+ 1.7
Joan of Arc,	+ 1.6	+ 0.4	+ 0.8	+ 1.6	+ 1.8	+ 1.2
Champlain,	+ 1.2	+ 1.5	+ 0.8	+ 1.2	+ 0.2	+ 1.0
Richelieu,	— 1.3	— 0.9	— 0.6	— 1.3	+ 0.2	— 0.8
Gustavus Adolphus,	— 2.4	— 1.3	— 1.3	— 2.2	— 2.0	— 1.8
Franklin,	— 0.6	— 1.4	— 2.3	— 1.8	— 3.9	— 2.0
LaSalle,	— 3.1	— 2.1	— 3.3	— 2.1	— 3.5	— 2.8
Mazeppa,	— 4.0	— 4.1	— 3.1	— 3.8	— 3.2	— 3.6

The aim in selecting the names comprised in the list was to avoid such special forms of bias by scattering them widely while ensuring general acquaintance with the characters chosen. The most unsatisfactory single feature of the group is of course

that of Franklin, who is at once the most recent and probably the most familiar of the series. No positive error therefore can ever occur in his case; and the name which would head the list were free displacement allowed appears here in the lower half of the scale. Nevertheless in spite of the change of direction in general interests which comes with age, the plus and minus groups are identically constituted in the two sets of returns. The illusion of relative perspective in time which is established in childhood concerning the great names of the world is neither corrected nor importantly modified in later life.

Several minor points remains to be noted in connection with the results in general. The reader may wish, in the first place, to know the relative magnitude of the average error for each class of objects respectively; in other words, which of these four groups of judgments manifests the greatest influence of secondary bias. This is shown in the following table:

TABLE XV.

Class.	Lands.	Rivers.	Cities.	Men.	Average.
Schools,	1.6	2.6	2.4	2.2	2.2
University,	1.2	1.7	2.0	1.7	1.6
Average,	1.4	2.15	2.2	1.95	1.9

A question may arise as to the nature of the prevailing type of error which gives form to the curves presented in this paper. A single displacement will produce in the results as many individual errors as the number of places it is removed plus one, and all of the series but one will be of the sign opposite to that which attaches to its own error. Thus if the fifth river of the series were put tenth its displacement would be -5, and the five rivers passed over would each suffer an error of $+1$. The frequency of plus and minus errors, independently of their quantitative values, therefore indicates the tendency which prevails in the judgments. These totals have been made out for the school children in relation to the ages of the pupils as shown in table XVI., which gives the average number of plus errors per series of ten judgments:

The two sexes are given separately, as their average would tend to obliterate the differences which exist. At all ages plus

errors are in the majority among boys, while in the case of girls an excess occurs but once. In so far as the figures have significance boys tend to err through the presence of positive underestimation of the less important members of the series, girls through overestimaiion of the more important. The intellectual illusion arises in the boy's case from ignoring the things which are of little interest; the girl errs through unduly magnifying the objects which she values. There appears also in the former case a progressive reduction in the excess of plus errors, which indicates the replacement of fewer and extravagant displacements by more frequent and systematic errors of interpretation.

TABLE XVI.

Class.	11.	12.	13.	14.	15.	16.
Boys,	5.7	5.5	5.5	5.4	5.2	—
Girls,	—	4.9	4.9	5.4	5.0	4.7

In the next place, the influence of these forms of secondary bias is manifested to a greater degree in the reports of school children than in those of university students as shown in Table XV., above, in which the figures indicate the average error of displacement in each series of objects for all observers concerned. In every class of judgments the mature group of subjects shows a more correct apprehension of the actual character and relations of the things compared than do the school children. Better acquaintance with the nature of these things through travel and reading, with possibly a more or less conscious recognition of and allowance for the element of subjective bias itself, has clarified the imaginative representation of them in the minds of the older persons.

Within the series of ages which the school returns comprise no correlation between age and decreasing error can be traced, the indices running as follows:

TABLE XVII.

Age.	11.	12.	13.	14.	15.	16.
Boys,	2.3	2.0	2.2	2.5	2.3	—
Girls,	—	2.4	2.3	2.3	2.3	2.8
Average,	2.3	2.3	2.2	2.4	2.3	2.8

The sexes are distinguished by an almost invariable difference in the magnitude of the errors involved. Men are more correct in these classes of judgments than women, and boys than girls. The figures for university students are given in the first of the following tables, those for the school children in the second:

TABLE XVIII.

Classes.	Men.	Women.
Lands,	1.14	1.25
Rivers,	1.45	2.05
Cities,	2.19	1.94
Men,	1.65	1.74
Average,	1.61	1.72

TABLE XIX.

Class.	Boys.	Girls.
Lands,	1.59	2.00
Rivers,	2.56	3.20
Cities,	2.57	2.60
Men,	2.23	2.70
Average,	2.24	2.62

This slight but persistent excess of error on the part of girls and women falls in with popular judgment concerning the susceptibility of mind in the two sexes to factors of subjective bias in general. The woman is supposed to be more prone to have her judgment of things and their relations in the external world distorted by the influence of their various symbolic values; the man is regarded as more objective and impartial in his apprehension of the contents of experience. Man's knowledge is discursive and the manifold aspects of reality are held in relatively independent regard, while in woman's mind the various interpretations of the world tend to overflow and confuse the classifications to which their special points of view give rise.

For the convenience of those who may wish to compare their own series of judgments with the results here presented the various countries, rivers, cities and men are given in correct order in table XX.:

TABLE XX.

Lands.	Rivers.	Cities.	Men.
Siberia	Lena	Rochester	Charlemagne
United States	Mississippi	Allegheny	Harun al Raschid
Peru	Mackenzie	Albany	Joan of Arc
Afghanistan	Danube	Camden	Drake
German Empire	Orange	Trenton	Champlain
Italy	Rhine	Harrisburg	Richelieu
Iceland	Petchora	Quincy	Gustavus Adolphus
Ceylon	Douro	Newport	LaSalle
Switzerland	Hudson	Springfield	Mazeppa
Palestine	Thames	Frankfort	Franklin

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MIND AS INSTINCT.

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The Problem Stated.

The thesis I wish to maintain in this paper, for purposes of simplification, is that all of our adjustments or categories, viewed from the individual or causal point of view, are instinctive or organic adjustments; that the stimuli, which constitute the environment, are simply the occasion for calling into play the structural tendencies of the organic growth series and that such categories, as recapitulation, imitation, and accommodation are pseudo-categories, stating certain results from the point of view of another consciousness, but not explanatory of the real process of consciousness. This I believe to apply to the whole history of individual consciousness, and not simply to its initial stages. If this thesis is true, there is no such thing as acquired characteristics, and progress must take place through spontaneous variations and natural selection.

The old idea of the evolution of consciousness as a continuous series, statable in terms of simpler processes from which the more complex were supposed to be compounded, has gradually become a thing of the past. Sensationalism, simple and plausible as it seemed, has been proven inadequate, and psychology is now looking not to chemistry, but to evolutionary biology for its cue. The reason for the discontinuity of the psychic series or its leaps and starts is that psychological process waits upon biological structure; and only when the biological conditions are complete do the new forms of consciousness leap forth as mysteriously as the wonders in rubbing Aladdin's lamp. The lamp is the thing, and just that kind of lamp, though of course the magic result would not follow unless the lamp were rubbed. With the perfection of the mechanism of the eye, to use Loeb's illustration, and the complicated structural conditions

for sight, light leaps into being. So with the mechanism of the ear and the wondrous world of sound.

The stages of consciousness at any rate are abrupt, however graded may be the development of the structural conditions. First of all, whether there is prenatal consciousness or not, consciousness waits upon certain antecedent structural conditions before it appears at all. Before the appearance of consciousness the fœtus in response to certain stimuli of temperature and blood supply has already unfolded a structural series embodying the revolutionary results of variations and survival of untold ages. But the unfolding of structural characteristics does not stop with the appearance of the first vague consciousness. In obedience to stimuli, intra- and extra-organic, the organism continues to grow and to develop new structural characteristics, and as the structural conditions reach certain stages of complexity there appear new forms of conscious response. Let us for our purpose state the dramatic stages as three: First, sensitiveness or immediate consciousness; secondly, associative memory and expectancy; thirdly, reflection, the analyzing out or making focal, to use Lloyd Morgan's term, certain relations and abstracting them for the better manipulation of the concrete situation. Now the thesis here maintained is that the successive appearance of each of these stages of development, with all their intermediaries, is equally organic and abrupt, the unfolding or growth of a structural series in obedience to certain stimuli, which do not make the series any more than the heat of the incubator makes the chicken, but which are simply the conditions calling forth the series; the stages of development from first to last, as well as what stimuli are effective, being determined by the nature of the organism, which again is what it is as a result of spontaneous variation and natural selection.

It is wrong to suppose with many recent psychologists and biologists that the human brain is essentially unorganized and that the environment organizes it. The environment, whether physical or social, can only furnish stimuli. The human brain is far more complex and minutely organized than that of any other being. But while the brain of the animals below man has a comparatively short dynamic span and the few instincts appear

practically together and mature shortly after birth, the human organism has a long dynamic span with an organic series of instincts maturing in a certain order. Natural selection has here provided for an hierarchy of instincts. But the law of development is the same: a certain congenital structural order unfolds itself in response to certain stimuli. That this structural development is in response largely to post-natal and extra-organic stimuli in the human being does not alter the instinctive character of the process. If we define instinct as a response to stimulus determined by congenital structure, then we may reduce all mental process to the category of instinct. The only question is as between earlier and later or simpler and more complex instincts. What must not be forgotten is that the growth order of our instincts, as well as the number of our instincts, is congenital. How it is that a growth order can be inherited and in what way the seemingly indefinite protoplasmic material can develop in mere response to stimuli a series of tendencies is as dark as is the problem of causation generally, and of transmission of characteristics at all in particular. We do not doubt, however, the innateness of the sexual response, though it is conditioned in the case of a human being by a complex and long series of structural growth. This one instance ought to convince us that the survival variations operate not only sectionally, but longitudinally in the stream of development. The absurd supposition of the English empiricists that innate is synonymous with that with which we are born and that the rest is acquired, is once and for all exploded by biology. Development before and after birth is due alike to an inner structural tendency unfolding in response to stimuli.

To suppose, therefore, as contemporary psychology still does, that the higher mental activities are complications of lower activities, that, for example, associative memory is simply the result of sensations and habit, that concepts are only a specific kind of association, and that thus the higher strata of experience are built right up from the lower is simply substituting chemical metaphors for explanation. If images were the complication of sensations merely, why is it that some of the animals lower in the scale, which show signs of sensation and habit, never

acquire images? They must have sensations enough — probably a larger variety than Helen Keller. And, again, if concepts and judgments are simply associations, why is it that animals with complex associative mechanism do not show any sign of abstract analysis? It is surely not the fault of stimuli, as they are surrounded by the same world in which we exist, hear the same sounds, and have the same variety of light and color. The higher types of reaction are not, therefore, compounded out of the simpler, though they may presuppose these. They are the result of structural development, not of functional adaptation. Given the inner structural equipment and we cannot help remembering and reasoning, but without that stimuli are of no avail. Let us now inquire a little more in detail into the stages of instinct.

Stages of Development and Their Characteristic Instincts.

Each of the stages or leaps of development mentioned above, sensitiveness, associative memory and reflection, has its own characteristic instincts, which emerge with the structural growth of which the above stages of consciousness are the coefficients. I do not deny that there are intermediary stages less dramatic, but those we can afford for our purposes to neglect. Nor must I be understood as holding that associative memory and reflection are in any sense creative of instincts. On the contrary, the later instincts may be said to be creative of them. They are simply the structural machinery which has proved serviceable, if not essential, in the unfolding of certain instincts, and hence this machinery has been grafted on the instincts or become congenital.

1. *The Sensitive Stage and the Primary Instincts.*

The instincts on the sensitive stage, and before that on the merely physiological, are relatively simple and general in character. They respond to a relatively primitive environment.

Looked at from a later point of view they are altogether egoistic, *i. e.*, they have to do with individual preservation, in the way of defensive and food getting series of reflexes. An

intricate series of structural adaptations has become purely mechanical when we have a chance to observe, such as the machinery for digestion, circulation, breathing, etc. If natural selection, acting upon spontaneous variations, has been able to perfect such a network of interrelated processes, with such continuity of operation as we find, for example, in digestion, from the preparatory seizing, deglutition and swallowing until the substances are converted into blood or carried off as excrement, we ought not to be staggered at the thought that our adjustments in general are a chain forged by natural selection and simply rattled off by the environment, making due allowance for the mechanical character of this figure.

The instincts that are usually credited to a human infant are such as grasping, sucking, crying and sneezing. A comparison is drawn between the human infant and the chicken, for example, to the advantage of the latter. That is misleading, however, as the human chick is still being fledged in response to external stimuli. Thus the development of sense and motor coördinations, and the coördinations of the senses with each other during the first weeks of the human infant are no less instinctive though they take place partly in response to extra-organic stimuli. It is the growth series of the organism that produces the instincts. The extra-organic stimuli stand in no different relation to the child than the prenatal stimuli to the chicken. The superiority of the child's development lies in the larger range of its stimuli, not in its less instinctive character. The same may be said of the more complex motor coördinations for walking. These are not learnt by experience. They de veloped even when an absurd system of swaddling clothes prevented functional adaptation. The human being is simply a long time being fledged. Using later categories, as we are forced to, we may say that the infant reactions at the outset are more general than those of the chicken, though here too we have to be cautious, as the reactions of the chicken are probably much more general than was supposed by early investigators. The chicken, according to Morgan, does not have a special response for the hawk, though it has a certain response for a certain *kind* of stimuli that have instinctive terror. It is probable that

instincts even lower down start as universals, but that does not prove that the process for making them more definite is any less instinctive. Only that natural selection has deferred this part of the series until extra-organic stimuli should be available.

If we look at the conscious side of the more primitive instinctive adjustments we find ourselves on a rather speculative foundation. Where consciousness is not efficient, its presence must naturally be conjectural, and a large number of reactions not only in the lower animals but in human beings can be treated as tropisms. The going off of the early instincts is largely a penny in the slot affair, to use Lloyd Morgan's figure. Consciousness is at first at most a spectator. If consciousness is present the proper working of the slot is accompanied by a pleasure value, the improper by pain. Thus likes and dislikes on one hand and reactions, advantageous and disadvantageous to the organism, on the other tend to coincide. But it would be wrong on that account to emphasize the part of pleasure-pain in the evolution of instincts, for, on the one hand, complex structural adaptations exist which seem purely physiological, and on the other hand, where pleasure and pain now indicate survival value, it is simply because as a result of the sorting of natural selection they have survived. Where the environment changes rapidly and where the law of natural selection has not chance to operate, pleasure and pain are not sufficient guides. Witness the cows transplanted to South America, which took pleasure in poisonous weeds, and the birds on the South Sea Islands spoken of by Darwin, which lacking the instinct of fear toward man paid the penalty until they were either exterminated or established the instinct. Witness, too, the large number of pleasures in human beings such as indulgence in opium, alcoholic liquors, and various forms of sexual excess which are pernicious and on which the law of natural selection has yet failed to operate. Pleasure and pain have indeed become a vital part of the functioning of some instincts, though of others not. It surely would be absurd to try to state our primary instinctive reactions in terms of mere subjective teleology, as some seem inclined to do at present.

The stimuli which make the slot work may be qualitative

differences, such as loud sounds or brilliant lights, or they may be behavior stimuli, which call forth similar movements in the individual. But in either case we have simply a stimulus as setting off a congenital structure. The reaction on behavior stimuli is sometimes called imitation. But this is the significance of the reaction to the psychologist, who compares it with the behavior stimulus. It is not imitation or accommodation to the child or animal. It is simply a case of a fascinating stimulus, which is only another name for fitting the slot and the slot going off. Interest always waits on tendency. If the child prove to deviate or to be original in its imitation from the spectator's point of view, that is because it does not imitate but responds to the stimulus in a way dictated by its structural tendencies. If it continues the process, that is not for the sake of approximation, but because given such structural tendencies it cannot help going off and feeling a satisfaction in the process.

Sometimes instincts are explained as recapitulation, and they do indeed have a long survival history back of them. But to call them recapitulatory is again the point of view of the external observer who compares the reactions with those of ancestors. But the individual on the level of sensitive consciousness at any rate does not act to recapitulate his ancestors. The spring for the action must be found in his own organic machinery, whether it agrees or disagrees with that of his ancestors. There is no such thing as evolution in the sense of simply marching the old categories upon the stage again as implied in recapitulation. The machinery for imitation, accommodation, and recapitulation only exists when the individual has in mind a copy of the behavior of others, whether past or present. But even on that level the springs for the action must be sought in the individual structural tendencies. He does not imitate because of imitation or recapitulate because of recapitulation, but because he is wound up in such a way that such stimuli appeal to him or set him off. Such categories as imitation, accommodation, and recapitulation are not explanatory categories, they are simply comparisons as made by an observer external to the process. They are pseudo-categories.

2. *Associative Memory and the Secondary Instincts.*

While the stimuli are playing the primary tendencies and under the shelter of the parental and other social instincts of the individuals of its immediate environment, the organism is busy perfecting the structure for the later instincts with their more complex machinery. These we may call secondary, though that does not mean that they are less instinctive. They only presuppose a greater structural differentiation. Lloyd Morgan speaks ot the mother hen protecting the chick from the law of natural selection. That is true in the chick's individual capacity, but we must not forget that it is as a result of natural selection that the parent has its parental instincts which shelter the newly developed chick. Before the chick has social feelings it has the shelter of social feelings. Natural selection has operated to produce a group supplementation of instincts. It can thus telescope the undeveloped structure into the later structures of other individuals, at the same time providing in the behavior of the more developed members of the group the stimuli to call off the dynamic tendencies of the immaturer developing structure, thus lengthening the dynamic span and increasing its developmental possibilities. It must be remembered, however, that the social environment occupies exactly the same relation to the developmental series as the physical. It can only furnish the occasion or stimuli for calling off the dynamic series. There is no social heritage in any other sense than there is a physical heritage, a set of stimuli, pennies for the slot that will make it go off, if they fit.

Looked at from the point of view of race history, the mechanism for associative memory must be regarded as a lucky variation or an accumulation of variations which make it possible to live an experience again, given an internal or external cue; which make it possible, therefore, to guide the present beck of stimuli with reference to consequences of past experience, thus making instinct more definite and serviceable, a reaction on particulars and not merely on a vague kind. The survival value of such an organic leap must have been momentous. For whatever history of accumulations of survival this machinery may represent on its structural side, from the point of view of con-

sciousness it is a radical leap. There is no way of reducing efficient consciousness into simply mere consciousness of the concomitant or spectator kind; no way in which the play of immediate impulse with its simple machinery of tedious trial, gradual elimination, and dumb, monotonous habit can be made to yield a picture of the past result and a short cut to reaction on the basis of it. Using the penny-in-the slot illustration again a new mechanism has been introduced into the slot that not only makes the slot register its going off, but also uses as guide the structural picture in its next going off.

But the new machinery is still essentially a slot. It is conditioned through and through by organic tendencies: organic tendency in the form of instinct conditions interest; organic tendency in the form of habit makes dynamic continuity possible; and organic tendency as specialization of structure conditions the kinds of imagery or content the operation shall have. While the machinery, therefore, is vastly more complex and immensely more efficient in its greater scope of coördination and its greater economy of effort, it remains as organic or instinctive in character as before.

With the perfecting of the machinery of associative memory there leap into being in their proper order a totally new group of instincts, the social instincts. While these instincts are conditioned by the more complex structural machinery, that does not mean that they are the result of associative memory. The latter might make us more efficiently egoistic, but could not change our fundamental attitude. The social instincts are rather the rationale of the more complex machinery than vice versa. Only thus could the social instincts become efficient. But with these instincts and the associative mechanism the individual is equipped for the beginnings of group life with new possibilities and necessities of survival variations.

That associative memory and the fundamental social instincts are interdependent is shown not only by observing the coincident appearance of the two in the development series, but more conclusively by the vivisectional and pathological methods. In the experiments of the removal of the hemispheres of the dog, the pigeon, and the frog, for example, it has been shown

that all social, which here means primarily sexual, response vanishes together with associative memory. The same is shown in wide-spread injury in the human brain, in such a case as that cited in Huxley's essay on Animal Automatism, and in the recent case in Paris of a human being born without hemispheres. Regarding the matter merely logically, it is hard to see what social could mean apart from representation, though representation can be conceived without sociability. But while the social instincts thus wait upon a certain structural development that makes them no less organic and fundamental in nature.

There are, properly speaking, no such things as social categories. Imitation, sympathy, the whole list of sexual, parental and more general group responses, constituting social fitness, must be reduced to individual variations, which have proved to have survival value and which in turn have come to condition the survival of individuals exceptionally lacking or over-redundant in such variations. What environment furnishes and all it can furnish is the stimuli and the survival conditions.

3. *Reflection and the Tertiary Strata of Instincts — The Ideals or Sentiments.*

While the environment is finally playing the primary and secondary instincts, and under the shelter of the later ideal tendencies or sentiments of the group, the human organism is perfecting its structural machinery for the issuance of a new set of instincts — demands that have to do with the unity and meaning of experience. Given a certain complexity of our registering slot, and there appears the power of analysis and abstraction. This again is a leap, perhaps the most wonderful leap of all. Consciousness by a new device is able to hold its head above the passing stream and survey the before and after. It no longer merely *is* but *sees* the passing events. From the point of view of race history it means a lucky structural variation or accumulation of them, which changed the whole course of evolution by giving meaning to the process and thus establishing new survival values. With the individual, however, reasoning, as habit and associative memory, is congenital, appearing when the proper structural series has been passed through in

response to the stimuli of the environment, which now first become problems.

Some psychologists have held that reasoning has its beginning in language and that it is in language that man is especially superior to the animals below him. But language in some form can exist without reasoning, as is shown in animal life and as people's creeds and platforms still testify. Given the structural machinery for abstraction, and language becomes an indispensable instrument and so has developed to answer the demands of reflection. Nor can reason or meaning be reduced to lower forms of consciousness. It is not more of dreamy association, however complex the latter may become. It is a new attitude. However much its genesis may exceed our comprehension, we have now the structural machinery for holding ourselves, *i. e.*, our primary and secondary instincts, at arm's length and looking at ourselves, a mechanism which furnished us with those tools by means of which we can break up our world and select those relations and objects that have meaning and value for us, instead of dealing with the world as a collection.

With the structural machinery for reason there appear a new group of tendencies, demands for simplicity and consistency, for unity and wholeness, for truth, for right, for happiness, for beauty, for a religious and philosophic setting for our tendencies or needs. From the vantage ground of this new structural differentiation the primary and secondary instincts can be surveyed and evaluated, and a whole constituted. Yet our bias for simplicity and consistency, our sentiments for truth and beauty, are in their deepest roots instinctive, however luminous they have made the pathway of life. The deepest attitudes towards the universe were never invented by man; they are not the result of a consensus of opinion; they are presupposed, on the contrary, in all our reflections upon life. Without them we should not have raised the question of why and wherefore nor have felt the need of a consensus of opinion. Our highest activities, therefore, no less than the most primitive, move within instinct, are the response of our organism to the call of the environment. Before these instinctive demands existed there

was no call, for the environment spoke to deaf ears; there was no riddle of the Sphinx, only a vacant stare; no order, but only the passing show of meaningless events.

It has been said as a criticism against Kant that his categories are shot out of a pistol. This is true of reflection generally, as well as its fundamental categories. Reflection, analysis or meaning, when it appears is not more complex associations merely. It is a radically new attitude. It did not grow out of previous non-reflective experience, however complex. Stimuli, intra- and extra-organic, have been acting upon the organism. These have been the occasion for the organism unfolding its structural series, according to its own inner dynamic unity, until at the beck of the ever-active environment there leaps forth reason, abruptly as Athena leaped from the head of Zeus and mysteriously as Aphrodite rose from the sea. The self is awake instead of dreaming. This could not be due simply to the call of the environment, for that has been comparatively stable. Rather the reason for the call being a call must be sought in the new structural conditions perfected for the purpose. Just as sexual love appears at a certain stage of development, when certain structural conditions have been completed, and a totally new response is made to old stimuli, so reason appears suddenly and unsolicited, when the structural series reaches a certain stage. We ought to speak, therefore, of falling into reflection as we speak of falling in love. This I need not say has nothing to do with Flechsig's attempt to establish a distinct anatomical center for higher mental processes. This theory no more stands or falls with his success or failure than does the instinctive character of sexual love with the phrenological bump of amativeness.

What has been said of the more general categories holds equally for the more particular preferences and tastes that go to differentiate one individual from other individuals. Imitation no more on the higher than on the lower levels creates tendencies; but a certain stimulus is the fascinating thing, because a certain structure is set off. The illuminating sanity of James, Royce's æsthetic bias for an Hegelian absolute, and Münsterberg's love of diaelectic — all are organic, *i. e.*, condition, and are

not made by environmental stimuli. There is a certain sameness indeed in our categories and preferences, in-so-far as we are normal, due to survival conditions. This is especially true of our moral tendencies which would be especially concerned. Beyond the dead level, however, which keeps us out of the penitentiary or the insane asylum, our tendencies or preferences vary vastly. Here natural selection is tolerant of sports, and the more so the more evolution progresses. This helps us to understand the different tastes which become creative of such different types in philosophy and art. It also accounts for the utter lack of finer æsthetic or philosophic appreciation in the larger number of men. These are so far aristocratic variations.[1] Yes, if we are poets or artists or philosophers or scientists at all, we are born such, and not only to the class but to that particular type that characterizes our contribution from that of others, though of course owing to a defective environment our tendencies may never be played so as to develop the possible scale of values. Only the other day I was startled by the striking resemblance between a cabman and a great philosopher that I know. Had the environment played the scales with some degree of skill, the cabman might have been a philosopher and with a different set of stimuli the philosopher might have been a cabman. Again, we find too often those lacking evolutionary qualifications holding down the job; and men without philosophic insight respond with a feigned adjustment of mere words, as the color blind man classifies the beautiful world of colors in his own series of dull grays. Sometimes the lack of native equipment is in more elementary tendencies as in the incapacity shown by some people for the rudiments of number or language, sometimes it seems a lack of the more fundamental moral tendencies, though the clumsy and unnatural order of our stimuli may be responsible rather than the native equipment. Out of the young criminals committed to the Iowa Industrial School at Eldora about eighty per cent. turn out honorable men.

[1] Of course, in the progress of civilization, tendencies such as the higher æsthetic may become more universal as an equipment of the race; and 'he that hath no music in himself' may in such a state of society be regarded as 'fit for treasons, stratagems and spoils' and dealt with accordingly. A higher moral equipment, at any rate, is gradually demanded.

If we say that what is native is docility, then at least we shall have to use the plural or docilities, because docility in one direction need not mean docility in another. But what does docility mean? Is it not like imitation, a mere name for a result? Is not man docile in very much the same sense that the slot is when the proper coin is put in and it works? A man may be docile as regards things intellectual and not to things æsthetic, to one kind of intellectual things rather than to another, and to one kind at one stage of his development, to another kind at another stage. Docility, then, must find its explanation in the fact that certain tendencies or instincts can be set off by a certain kind of stimulus.

While the machinery of reason was evolved for the sake of the earlier instincts and those that came into being with it, the machinery in some individuals, as a result again of variation, has become detached from the earlier strata and runs with wheels free. This is one of the forms of play, in other words, and the mechanism of reflection thus subserves a double purpose, that of coördinating the more primary tendencies and that of mere play, whether as abstract reflection and system making or perhaps working in the more picturesque material of concrete images, instead of words, in obedience to the sentiment for the beautiful. This play purpose of the reflective machinery may altogether eclipse the primary purpose, but even here the machinery is run by instinctive demands.

We have sketched broadly three stages of mind with their characteristic instincts and their characteristic mechanism for making the instincts effective: First, the stage of physiological or sensitive reaction, where consciousness is a mere spectator. Here appear the egoistic preservative instincts. The mechanism here is trial with gradual elimination and habit. Secondly, the stage of associative memory, where an image or past result can guide the reaction. Here appear the social instincts. This stage is vastly superior to the preceding in its coördination, in the complexity of its instincts and the economy of effort. Last of all we sketched the stage of reflection or meaning with the apparatus for survey, for selection, abstraction and substitution. With this appear the ideal instincts or demands. We have

seen too that each earlier stage as a result of natural selection can be telescoped into a later stage of the group by the providential arrangement that all individuals are not of the same age, but that the parents by the virtue of becoming parents have developed a later set of instincts, sheltering the offspring in their earlier stage and furnishing stimuli for the development of the structural series. As the later instincts appear, however, the earlier are telescoped into the later in the same individual and the later become the guides and the sheltering foster-parents of the earlier. Even on the reflective level the instinctive stages retain something of their integrity. We are not always, indeed very seldom, reasoning. In that case the next lower court presides. But even this may sleep or be disattached from the lower centers, and then the lowest presides. Or, taking a cross section of the reflective stage, while attention selects certain aspects as focal, in the marginal field we shade off into the more primitive stages of consciousness through borderline associations into dim awareness. And so the stages of race history repeat themselves in their general outlines, not only in the stages of individual history, but every day and, in fact, coexist in one attention moment the whole distance from tropism to reflective meaning.

The purpose of the mechanism of instinct, whether habit or associative memory or abstraction, is to make instinct more definite. Instincts are at first universal. They are fitted to go off at a certain kind of stimuli, on the lowest level a very vague kind indeed, but more limited with each stage. There is a good deal of difference between taste in general and taste for music. Habit is at best a clumsy device for limiting the kind, but memory makes possible reaction upon a particular, while the reflective machinery makes possible descriptive definition.

The whole series of life can thus be expressed in instinctive terms, both as regards content and mechanism — meaning by instinctive reaction a response that is called off as a result of organic structure, given the proper stimulus. We are such mechanisms as to develop in a certain structural order and to respond at certain stages in certain characteristic ways given a certain range and order of stimuli. The failure to call forth a

certain tendency in its dynamic order may fail to call forth other tendencies, as some tendencies are dynamically conditioned upon each other. Thus the failure to respond to sexual love must mean the failure to call forth the paternal tendencies and the failure to present the situations of danger and sacrifice must also fail to call forth the heroic tendencies. It is here that we are helped to some extent at least by the ideal situations of poetry and art.

Tendency and Environment.

It is clear now that the nature of the environment and with it the survival value of tendencies varies at each stage of development. In the early stages of evolution, survival is a matter of individual fitness based upon certain primary tendencies and their gradual definition by means of habit. Then the social tendencies emerge and survival value must be writ in tendencies that supplement each other so as to make group life possible. The primary instincts are thus telescoped into the more complex secondary instincts with their mechanism of associative memory. Last come the ideal instincts, that appear with the power of analysis and abstraction, and primary and secondary instincts must be telescoped into these tertiary instincts in order to meet the conditions of survival. With each stage of evolution instincts become more numerous and complex, and as the later individuals become part of the survival conditions to be met, the survival conditions become more complex.

But with greater complexity goes also greater freedom of development. The transmitting of variations is not limited to those immediately involved in survival; and in the greater differentiation of labor possible under an industrial regime, survival takes many directions. Thus a greater variety of tastes makes possible a wider range of survival. There is room for the musician and actor and sign-painter, as well as the mechanic. Then, too, the instinct of pity or sympathy shelters the unfit, for the time being at least, thus complicating survival conditions.

Survival conditions never change more rapidly than in a

civilized environment. While in one generation an artistic genius starves to death on his art, in another he can dictate his own terms provided his style of art becomes a fad; while in one generation a man would be deemed insane for printing or making furniture by hand, when factories can turn out as serviceable goods by the millions, in another he can become wealthy and famous besides; while in one generation the stake, the cross and the gibbet cut short the opportunity of the heretic from propagating his doctrines and the species, in another he gets the praise of men and the fat salaries, while the orthodox man is doing the starving stunt. And so it goes, all because different ages produce or at least stimulate different tendencies.

It is clear, then, that Spencer's idea of a finite static environment which would permit of absolute adjustment once and for all, and a consequent relapse to the level of the primary instincts, neglects the fundamental nature of the evolutionary process. Environment is not merely the mechanical and stereotyped part of nature, but first of all man, and in man the evolutionary process so far from having stopped is going on only with more rapidity as it becomes more complex. Our environment never was more in the making than now and never furnished as large or rapidly shifting a scale of selective values. If the old men just now are in danger of being shelved, as is often complained, it is not so much because they are old as that they grow stereotyped and cannot keep up with the rapid rearrangements. The young old men, the geniuses of the race, were never more valued.

What the social environment does, then, as embodied in human behavior and in the products of mind, is to furnish ever new stimuli and more complex survival conditions. What the individual must do to respond to the fullest extent is to meet the new demands with the corresponding variations. Fortunately it is not necessary to respond to more than a small number of the physico-social characteristics in order to survive. Only an absolute being could be equipped to respond to the universe point for point. A man may reach the highest eminence of social usefulness by the narrowness of his speciality, if for the rest he conform to certain general survival tendencies such as honesty and truthfulness (and I regret to say that does not always

seem necessary at present). Thus he may rise to the highest efficiency in the business world without responding to things philosophical, artistic, or even religious. A genius is one who is gifted with an unusual variation, either in the direction of that which has no direct survival value but calls off the play tendencies of man, such as art, or in the direction of greater survival advantage, as in the case of the moral prophets or the inventors of tools. Nothing is more obvious than the marked difference in the range as well as quality of response in different individuals. Some brains, as those of the idiot, are remarkably opaque, others, like those of the genius, show a wonderful power of refracting light in brilliant and unusual ways, but each mind reflects the light by virtue of its own constitution as manifest in each stage of the series.

We get as much value and significance out of nature and institutional life as we have corresponding tendencies. To the man who lacks the play of æsthetic tendency and who is preoccupied with the primary and secondary instincts 'sunset and evening star' are nothing, except perhaps a weather sign. In the words of Coleridge,

> 'O Lady, we receive but what we give
> And in our life alone does nature live.'

And so with the institutional equipment of the race. Our religious tendencies determine our religion, not the opposite. If we lack the feeling toward the supernatural and the sense of dependence, religion is not for us. If we are lacking again in æsthetic appreciation it is very natural that we should deem art useless or worse and proceed to make bare the temples, or even destroy them as some would-be reformers did. As the difference in creeds and the dread of hell disappear, religious denominations will separate in their worship on the ground of the real psychic preferences of individuals as regards the emphasis of the ethical, the mystical, the æsthetic, or the philosophical tendencies, always with the possibility of course that the more primary tendencies of custom and loyalty may keep a man where he does not psychologically belong. Institutions are created by our tendencies and they are properly selective of us only as they make tendencies go off in us.

That is as true of the state and family as of religion. The fundamental virtues which underlie social life, such as honesty, truthfulness, and kindness cannot be produced in people. The exciting of other tendencies, such as fear and gain may produce counterfeit reactions for those mentioned above, inhibiting the original tendencies. And some people live a respectable life that way no doubt. But it is a great mistake to suppose that because the child at one stage of its development reacts largely on the basis of the primary instincts and shows no sense of truth, or honesty, or kindness, or beauty, that, therefore, these tendencies are produced at a later period. They are acquired no more than love is acquired as the nervous system matures, though an awkward regime of stimuli may indeed fail to set them off. Our bias for landscape painting instead of character sketches; Ingersoll's fondness for the babble of the brook and fear of Niagara; our preference for the cathedral to the Quaker meeting house, in so far as preference is active; our enjoyment of lyric sweetness rather than the searching of tragedy, — all these preferences are conditions or presuppositions of our experience; and while they may be violated or forced by the environment, cannot be produced by it.[1]

[1] I take pleasure in acknowledging my indebtedness to other workers in this field, especially Principal C. Lloyd Morgan and Professor James Mark Baldwin, who by their splendid works have directed me into this field of thought.

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